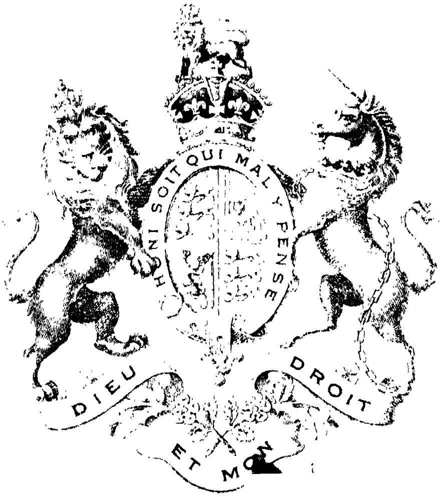
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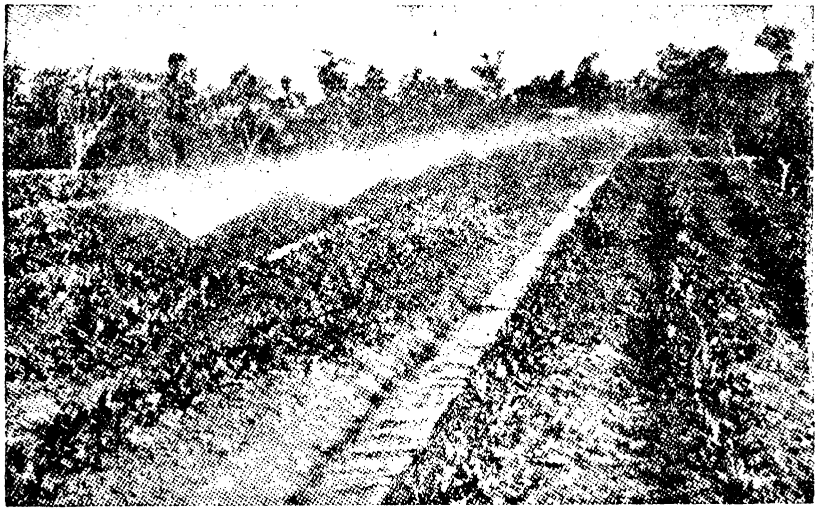

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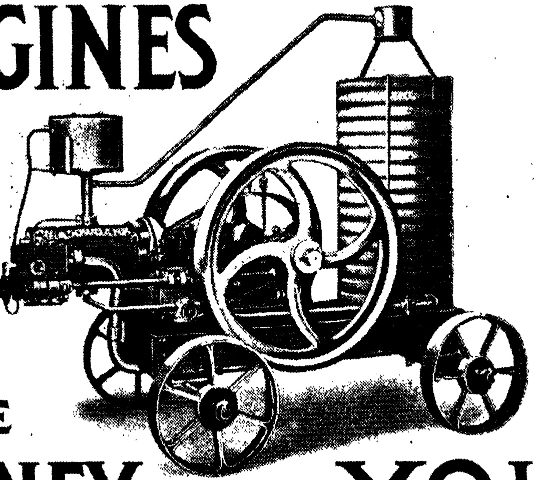

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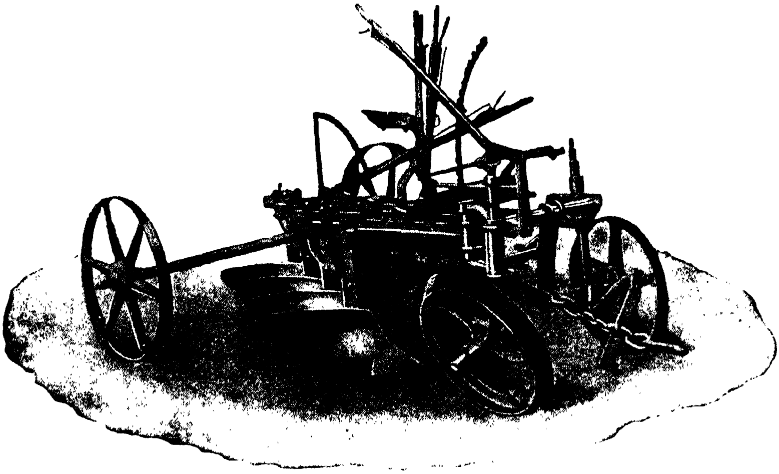

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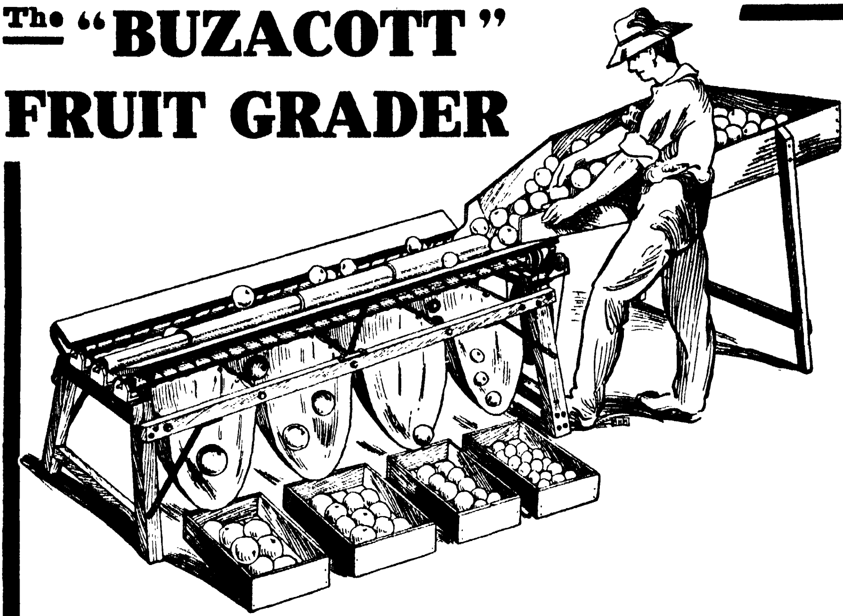

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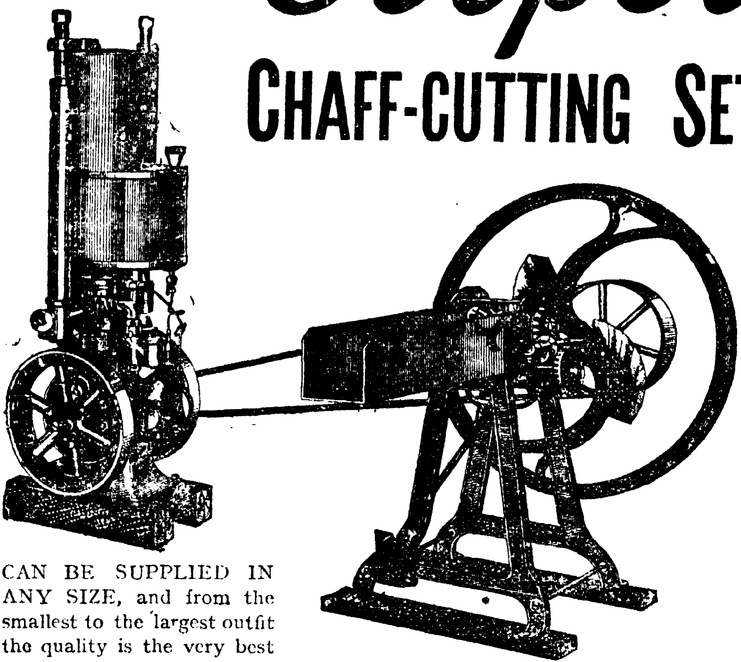

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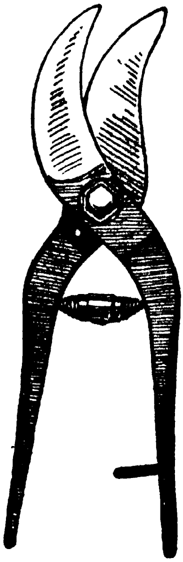

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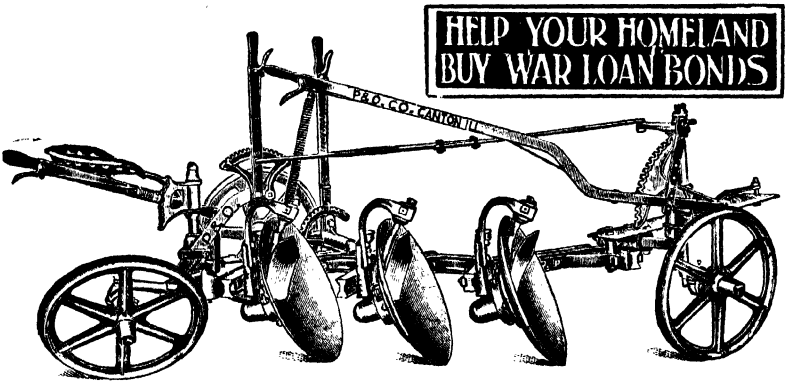

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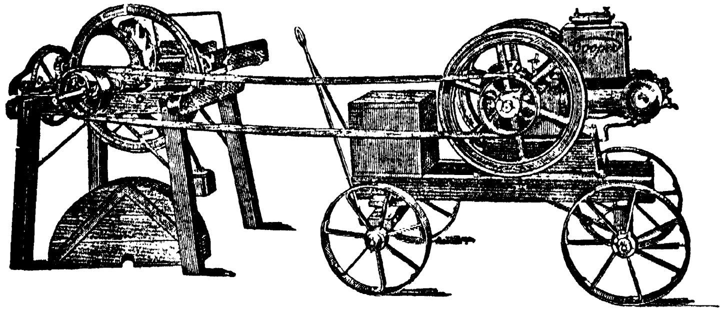

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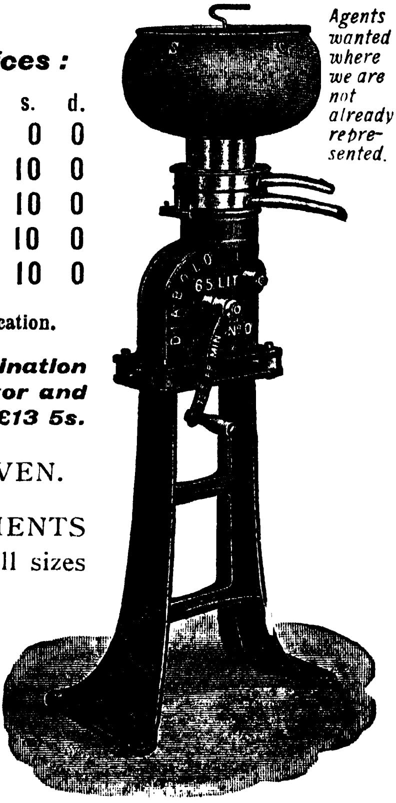

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MENTION THIS "GAZETTE."

VOL. XXVIII. PART 1. JANUARY 2, 1917.

Agricultural Gazette of New South Wales.

Lime on the Farm.

[Continued from Vol. XXVII, page 851.]

F. B GUTHRIE.

Other Uses of Lime on the Farm (*continued*).

(2) LIME AS A FUNGICIDE AND INSECTICIDE.

LIME, or indeed any alkaline substance, has a poisonous action on spores of fungi. As it has little or no action on woody fibre it is used extensively for painting tree-trunks or as a spray. Lime or milk of lime is liable to injure young buds, but can be used with impunity on the adult plant or trees in the manner mentioned above. It is immediately poisonous to slugs or snails, and in vegetable-growing it is used for this purpose, either by blowing it on to the leaves, or by placing it in the dry state on the ground round the plants. In vineyards lime is often used for the same purpose. Finger and toe disease in vegetables can be prevented by placing quicklime in a depression round the plants.

The toxic action of lime on fungi, though decided, is weak, and the use of lime alone—for example, in the destruction of bunt and smut spores on seed wheat—has given way to that of more active anticryptogamic agents, such as bluestone, formalin, corrosive sublimate, &c.

The principal use of lime in this connection is as a second bath after the immersion of the seeds in bluestone. Its action in these circumstances is twofold. In the first place it neutralises the injurious effect of the copper sulphate (bluestone) on the germinative power of the seeds, and in the second place it fixes the active products in an insoluble form on the seeds. Grain which has been soaked, for example, in bluestone, while freed from bunt-spores, loses its germinative power to a large extent. By immersing seeds so treated in milk of lime immediately after they are taken from the bluestone bath, the copper sulphate is converted into a mixture of copper hydrate and sulphate of lime, which mixture forms an insoluble preservative deposit on the grain, and at the same time protects them from the invasion of fungi present in the soil.

The method recommended by the Department is shortly as follows:—

A solution is made by dissolving 1¼ lb. bluestone in 10 gallons water in a wooden cask. This is best done by tying the bluestone in a hessian bag and suspending it half immersed in the water. The wheat to be pickled is placed in butts of not more than 1 bushel, immersed in the bluestone solution for three minutes, and shaken up and down continuously.

The butt is now lifted on to a sloping wooden plank and allowed to drain for ten or fifteen minutes. The butt is next dipped into a solution of lime-water made by stirring ½ lb. freshly-burnt lime into 10 gallons water; allow to settle, pour off the clear liquid and immerse the seeds for two or three minutes in the clear lime-water. The butts are again allowed to drain, and the seed is ready for sowing, or may be stored without risk of losing its germinating power.

A full description of the process and the precautions to be taken is given in the *Agricultural Gazette* for March, 1914, or may be obtained on application to the Department.

In this case, quicklime (freshly-burnt lime) is recommended. If this is not obtainable, it is recommended to make a milk of lime by mixing ½ lb. slacked lime with 10 gallons water, and dipping the butts in the milky liquid thus obtained for two or three minutes.

Insects are less susceptible to the action of lime; nevertheless, both milk of lime and powdered quicklime are used with good results in many cases. Scale insects are often destroyed by treating them with milk of lime. When the water evaporates, the lime contracts, and in so doing detaches the shell from the branch to which it is fixed, and so destroys the insect.

Nematodes are also very susceptible to the presence of lime, and in limed soils these worms are destroyed.

Lime-sulphur.

This compound is far more effective, both as an insecticide and fungicide, than lime itself, and is rapidly growing in favour with orchardists and vignerons.

It is obtainable as a commercial preparation, but it can also be made much more economically by the orchardist himself.

It is made by boiling together for an hour 53 lb. quicklime and 100 lb. sulphur in 25 gallons of water, and making up to 50 gallons with cold water immediately after boiling.

Full details for its preparation are published in *Farmers' Bulletin*, No. 72, "Spraying," obtainable from the Department of Agriculture.

In this are also given instructions for diluting the stock solution for winter and summer spraying. The Bulletin referred to contains a warning that in some districts, owing to different climatic conditions, a spray of a given strength will damage the foliage, whereas in other districts no ill-effects are noticed with a spray of the same strength, and advises that, before spraying the whole orchard, tests should be made on a few trees in order to be sure of the proper strength.

The action of lime-sulphur, or of any alkaline sulphide, is similar to that of sulphur. The lime acts by bringing the sulphur into solution, and rendering it more active. Lime-sulphur has the advantage over alkaline sulphides, such as sodium or potassium sulphides, in that it is less caustic and consequently not so liable to injure the foliage. Any such risk can be minimised by adding to the lime-sulphur solution some substance like glycerine, which, while it assists the fungicide to adhere to the leaves, diminishes at the same time the rate of decomposition by protecting it from the moist air, and thus prevents the formation of sulphuretted hydrogen, which appears to be the chief cause of injury.

Instead of glycerine, soft soap, molasses, or milk of lime may be added to the lime-sulphur with the same object.

Bordeaux Mixture.

Lime is also an important ingredient in the well-known fungicide known as Bordeaux mixture. This is a mixture of 6 lb. sulphate of copper (bluestone) and 4 lb. quicklime, made up with water to 22 gallons for winter use, and to 50 gallons for summer use. Full instructions for its manufacture are given in *Farmers' Bulletin*, No. 72, "Spraying." The lime has the same function in this mixture as in the case of dipping seed wheat after immersion in copper sulphate—that is, it neutralises the copper sulphate and so prevents the damage which the free copper salt would do to the foliage.

The copper compound formed by the action of lime is deposited on the leaves in an adherent and insoluble form. This appears to become assimilated by the leaf in very minute quantities at a time, which quantities are sufficient to destroy fungi. Copper in such minute proportions appears also to have a distinctly beneficial effect upon the plant, making assimilation more active, and stimulating the production of chlorophyll and generally increasing the vigour of the plant or tree. In larger doses copper salts act as a plant-poison, so that it is very important that sufficient lime should be present to convert all the copper into the insoluble non-assimilable substance referred to.

Gypsum.

In discussing the use of lime, reference was made to its action in destroying injurious fungi in the soil, especially those that attack the roots of many trees and crops.

Gypsum is very commonly used for the same purpose, and is found to prevent the rotting of the roots due to the most diverse fungi. It has also been found effective against many insects attacking vines. For this purpose it is dusted on to the under-surface of the leaves.

Gypsum or sulphate of lime, not being caustic, only acts as an insecticide by asphyxiation, being introduced in a fine powder into the respiratory organs of the insects, where it absorbs moisture and swells up, causing death by suffocation. Cockroaches, and even mice and rats, may be killed by laying baits consisting of flour mixed with ground gypsum. The best kind to use is burnt gypsum or plaster. This substance eagerly absorbs water and sets into a hard lump inside the stomach, thus causing death.

(3) USE OF LIME IN SOFTENING WATER.

With the exception of rain-water, the water obtainable on the farm contains a greater or less proportion of saline matter in solution, which renders the water hard.

Water especially that has passed over limestone country is generally rich in lime-salts, and such water may be so hard as to be objectionable for household purposes, or for use in boilers, the presence of excessive quantities of lime-salts preventing the water from forming a lather with soap and forming a deposit or a closely adherent scale when used in boilers. A very hard water is also not suitable for drinking purposes.

Frequently this hardness is due to the presence of carbonate of lime held in solution by carbonic acid. In this case such hardness can be removed by the addition of lime, and is known as temporary hardness. Softening by means of lime is carried out in many water supplies of cities which depend for their supply on water impregnated with carbonate of lime. The reason of this apparently paradoxical action of lime is that the freshly added lime-water (hydrate of lime) combines with the carbonic acid and so renders it no longer capable of holding the carbonate of lime in solution, and if added in the correct proportions, the whole of the lime present—both that held in solution in the hard water and that added in the milk of lime or lime-water—is thrown down as an insoluble carbonate of lime.

The following equation may be taken to represent what takes place:—

$CaCO_3H_2OCO_2$	+	$Ca\,(OH)_2$	=	$2\ CaCO_3$	+	$2\ H_2O$.
Solution of carbonate of lime in carbonic acid (hard water).		Milk of lime or lime-water (calcium hydrate).		Calcium carbonate, insoluble.		Water.

56 parts of quicklime made into milk of lime are equivalent to 100 parts carbonate of lime—so that if a water is found to contain, say, 20 grains per gallon of carbonate of lime in solution it will require the addition of 11·2 grains of quicklime made into milk of lime to neutralise it, or 112 grains to every 10 gallons.

The milk of lime is added to the water in a tank and allowed to settle for a few days, when the whole of the lime will be thrown down, and the clear water, which is now soft, can be run off.

The softening process takes place more rapidly if the whole of the lime required is added to three-quarters of the total volume of the water to be softened, stirred well, and then the rest of the water added. In this case eight or nine hours is sufficient to complete the process.

It must be remembered that the addition of lime only softens waters which owe their hardness to carbonate of lime ("temporarily" hard waters); waters which are "permanently" hard owing to the presence of sulphate of lime, calcium chloride, &c., cannot be softened by this means.

(4) Use of Lime in Whitewash, &c.

Lime or whiting (which is carbonate of lime) is the basis of the more common mixtures for whitewashing walls and ceilings of farm buildings, dairies, &c. The following are amongst the formulæ which have been found in practice to be most satisfactory for the purpose. Most of them have appeared already in the *Agricultural Gazette*, and those that are here reproduced have been tried and found to give good results.

United States Formula.

One of the best whitewashes, and one which can be relied on to make a brilliant and enduring coating, both for indoor and outdoor work, is the formula used by the United States Government in all their important work, such as lighthouses and public buildings. It is the one used for the painting of the White House in Washington. Similar formulæ have been published in the *Agricultural Gazette.* The following is taken from an American publication, "Twentieth Century Recipes," and is said to be the one actually adopted by the United States Government:—

Unslaked lime	2 pecks.
Common salt	1 peck.
Rice-flour...	3 lb.
Spanish whiting	½ lb.
Glue (clean and white)	1 lb.

Water in sufficient quantity.

Slake the lime in a vessel of about 10 gallons capacity, cover it, strain, and add the salt previously dissolved in warm water. Boil the rice-flour in water, soak the glue in water and dissolve on water bath, and add both, together with the whiting and 5 gallons of hot water to the mixture, stirring all well together. Cover to protect from dirt, and let it stand for a few days, when it will be ready for use. It is applied hot.

Refrigerating Wash.

The following formula provides a cooling covering for either rough timber, brickwork, or corrugated iron, and is said to be as effective in reducing temperature as the best of the refrigerating paints:—

Quicklime	10 lb.
Glue	1 lb.
Powdered alum	1 lb.

Slake the lime with hot water, keeping it covered during the process. Dissolve the glue and the alum in hot water and mix well together with the slaked lime. Do not make too thin. Strain the mixture and cover for two or three days, when it is ready for use. Apply two coats, the second after the first has been well set.

A Good Dairy Wash.

The following is said to be a good wash for the walls of dairies:—

Slake ½ bushel of quicklime in boiling water, strain through a sieve and add 2 lb. sulphate of zinc and 1 lb. common salt, dissolved in warm water.

A very satisfactory and easily prepared wash may be made by slaking some lime and adding 1 pint boiled oil (linseed) to every gallon of the wash. Dilute with water to the required consistency.

Waterproofing Cornsacks.

A mixture recommended for waterproofing cornsacks is as follows:— Slake 10 lb. quicklime, strain, add 1 lb. glue and 1 lb. salt (both dissolved), then add 1 lb. fat or oil to every 4 gallons of the mixture. Stir well and cover for a day or so before using.

Artificial Stone.

The following provides a surface which is as hard as stone and which can be washed down. In fact it is said to become harder each time it is washed:—

Three parts powdered quartz.
Three parts powdered marble and sandstone (mixed).
Two parts burnt clay.
Two parts freshly slaked and still warm lime.

Make into a wash with water. The ingredients combine to form a hydrated silicate of lime and alumina resembling certain rocks. It is in fact an artificial stone.

The above are only a few formulæ for whitewash of which numbers have been published. In all the above the lime used is quicklime, which is slaked with water. In one case, at least, the slaking is to be done with hot or boiling water. This may hasten the slaking, but as water soon boils when poured on to quicklime the use of hot water does not appear to be necessary.

The addition of salt prevents the wash from cracking when it hardens.

The addition of sulphate of zinc imparts an enamel surface to the wash.

It is advisable to mix with the wash some substance to fix it; oil or glue are given in some of the above formulæ. Bullocks' blood is also commonly used. It is not advisable to use a limewash without some such fixing material, as it scales off in drying. Colours may be added according to fancy. Mineral colours—ochres, &c.—which are not affected by the lime must be employed.

Effects of lack of Lime in the Soil.

Soils deficient in lime are in nearly all cases less productive than those in which lime is present in fair quantities. They are also, as we have seen, likely to become sour—if they are not already sour—and in the case of heavy clays poor in lime they have a tendency to become sticky when wet and hard on drying. The presence of lime flocculates the colloidal clay, and renders it more friable.

Not only is the crop yield lower on lime-poor soils, but the composition and nutritive value of the crop may be injuriously affected. This has been shown to be the case in certain pastures on the South Coast which are poor in lime, and where bone-chewing by cattle (osteo-malacia) is prevalent.

BONE-CHEWING.

In certain districts of the South Coast the above disease is prevalent, and has been the cause of considerable deterioration of dairy herds and loss of life amongst stock. A close connection has been established between the nature of the soil, the quality of the herbage, and the incidence of the disease.

On land where bone-chewing is prevalent, the soils are found to be very poor in lime, and the grasses on such land are also very much lower in lime and potash and phosphoric acid, and possess a lower nutritive value than the grasses growing on unaffected land.

This subject is dealt with at greater length in Science Bulletin, No. 12, "Notes on Osteo-malacia." The following tables show the most striking results obtained:—

Composition of Soils.

	Lime, per cent.
Average of seventeen soils from affected areas	0·168
„ five „ „ (typical osteo-malacia soils)	0·076
Average of seventeen soils from unaffected areas	0·465
„ seven „ „	0·623

The potash and phosphoric acid contents of the soils from the affected area are also lower than the non-affected, but do not exhibit the same striking difference as is the case with lime.

Composition of Grasses.

	Percentage composition of Ash.	
	Lime.	Phosphoric acid.
Average of grasses examined from affected areas	3·08	0·98
Average of grasses examined from non-affected areas	9·11	2·76

The bones of the animals suffering from the disease contain less lime and phosphoric acid than is present in the bones of healthy animals.

Calculation shows that cows fed on the grasses from the affected areas would receive less than one-half the amount of mineral matter received by cows fed on the grasses from the good land, and considerably less than the quantity required by a healthy animal daily.

It has been found that stock suffering from the disease recover when moved to the better type of land.

Liming the land of the affected areas has been found to be beneficial. Stock suffering from the disease benefit by the addition to their daily ration of a little sterilized bone-dust, slaked lime, and sulphate of potash, and by having access to a lick composed of bone-ash, with a little common salt and sulphate of iron mixed with sufficient molasses to make the mass coherent and palatable.

(*To be continued.*)

A WARNING TO ORCHARDISTS.

ORCHARDISTS would do well to note when using American spray specifics (especially nicotine preparations) packed in the original bottles or tins that there is a substantial difference between American and British fluid measure. The American gallon is only five-sixths of the British. In consequence of this divergence the dilution as recommended on the package, if used with the British gallon, may cause the specific to be substantially reduced below the required strength. A rough rule to follow will be: When fluid ounces are mentioned to use one-sixth less water than the quantity referred to. If, however, the unit of measurement is the pint, no adjustment is necessary, and the dilution can be used as recommended.

The Work of Pasteur and its Influence.

WITH SPECIAL REFERENCE TO ITS APPLICATION TO AGRICULTURE.

[Continued from Vol. XXVII, page 859.]

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

IN 1865 the silkworm culture, which formed an important industry in the south of France, was threatened with ruin, in consequence of a most disastrous disease having made its appearance amongst the worms. The Government was appealed to for assistance. Some would insist that, under such circumstances, it should have engaged the services of a "practical" man. The Government turned instead to Pasteur, who had never even handled a silkworm in his life. The results he obtained justified his selection. The silkworm disease, which was known as Pébrine, had already been investigated, and it had been ascertaind that certain microscopic corpuscles were always present in the diseased larvæ and moths. Pasteur confirmed previous observations, but it is remarkable that he, with his knowledge of minute organisms, did not recognise for some time that the microscopic corpuscles were the cause, and not the result, of the disease.

The remedy which he suggested was, however, sound. He was convinced that the only way was to breed from moths not affected by the disease, and to this end he invented the plan which has been universally adopted, and has restored a source of wealth to the silk districts. Each female moth, when ready to lay eggs, is placed on a separate piece of linen, on which it may lay them all; and after it has laid them and died, it is dried, and then pounded in water, and the water is then examined microscopically. If "corpuscles" are found in it, the whole of the eggs of this moth, and the linen on which they are laid, are burnt; if no corpuscles are found, the eggs are kept, to be, in due time, hatched, and yield healthy silkworms.

In 1867, after having elucidated the fatal Pébrine disease, Pasteur was mortified to find that large numbers of silkworms still continued to die from disease. He finally recognised that there were two silkworm diseases, the Pébrine, due to the microscopic corpuscles (now known as *Nosema bombycis*), and a second disease known as the "maladie des morts flats," or "flacherie," which he showed to be a sort of silkworm cholera due to bacteria.

These early researches of Pasteur on silkworm disease have aided in the elucidation of the diseases which attack bees. In Australia bees are liable to be attacked by three diseases due to micro-organisms, viz., The "Isle of Wight" disease, due to a minute organism, *Nosema apis;* American Foul

Brood, due to *Bacillus larvæ*; and European Foul Brood, due to *Bacillus alvei.* The "Isle of Wight" disease of bees has certain symptoms that resemble the Pébrine disease of silkworms, and the diseases are produced by allied organisms. The American Foul Brood and the European Foul Brood are both produced by very minute organisms or bacilli, and a knowledge of the cause leads to a rational method of treatment. It is not necessary to enter here into a further description of these diseases, as they have already been dealt with in previous numbers of the *Gazette.**

From our present point of view, their interest lies firstly in the relationship existing between the "Isle of Wight" disease of bees and the Pébrine disease of silkworms; and secondly in that it was in this latter disease that Pasteur seems to have recognised for the first time the intimate connection between micro-organisms and disease. We may gather how conscious he himself was of the influence which the investigation of silkworm disease had had upon his outlook, from the fact that in later years, when young medical men were aspiring to undertake pathological researches in his renowned laboratory at the Institute, he never failed to say to them, "Read the studies upon silkworms; that will be, I believe, a good preparation for the work we are going to undertake."

The Treatment for Anthrax.

It was not till 1877, at the age of 55, that Pasteur embarked on the course of pathological study which was destined to make such an epoch in history.

It was to the problem presented by anthrax disease that he first turned his attention, and it is noteworthy that it was in the study of the same disease that the German, Robert Koch, one of the greatest masters of pathological bacteriology, first made his début, carrying out a series of investigations remarkable for their completeness and convincing force. It is difficult to realise in these days the difficulties with which the new views concerning the bacterial cause of disease had to contend, and it was of the greatest value in carrying conviction that there were two independent schools of bacteriological research—the French and the German. Pasteur, in repeating and perfecting the experiments of others, made new discoveries; thus the bacillus of malignant œdema was discovered, and it was shown that by inoculating harmless bacteria along with the anthrax bacillus, the latter may fail to produce its effect. This discovery opens out a vista of possibilities.

To-day we inoculate against anthrax by means of an attenuated virus, and the attenuation is brought about by cultivating the organism at an elevated temperature. Let us see how this idea of producing attenuation originated. "Another classical experiment belonging to this period strikingly illustrates the fertility of Pasteur's imagination, and the extraordinary good fortune that attended his speculations. It was known that birds are absolutely insusceptible to anthrax; this circumstance he was led to associate with their high blood temperature, namely, 42 degrees. I think most persons would have dismissed this idea as a passing fancy, but Pasteur submits it to direct experiment; he reduces the temperature of a fowl to 38 degrees by immersing its feet and hindquarters in water kept at 25 degrees, and finds that, on inoculation, it now contracts anthrax, from which it can be made to recover by allowing it to regain its normal temperature."* Thus, then, Pasteur was led to the discovery of the possibility of attenuating a virus by subjecting it to an elevated temperature.

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* The "Isle of Wight" Disease of Bees. G. P. Darnell-Smith. *Agricultural Gazette*, May, 1913.
The "Isle of Wight" Disease of Bees. G. P. Darnell-Smith. *Agricultural Gazette*, October, 1916.
Foul Brood of Bees. R. G. Warry. *Agricultural Gazette*, September, 1916.

His next discovery was not less remarkable. Returning from a holiday he found that all his cultivations of the microbe of fowl cholera were dead, or nearly so. He found that the fowls which he inoculated with these exhausted cultures continued to move about their pens in apparent health.

Having ultimately obtained a virulent culture, he reinoculated the birds which had survived the previous treatment. He was astonished to find that these birds resisted the attack of the virulent organism which proved rapidly fatal to those which had undergone no previous inoculation with the exhausted culture.

It was finally established (1) that it was possible to diminish or "attenuate" the virulence of a pathogenic organism to any desired degree; (2) that this attenuated virulence is hereditary, and can be propagated through practically an unlimited series of generations without alteration; (3) that the milder type of malady which follows upon inoculation of such an attenuated virus or "vaccine" is capable of protecting the animal from subsequent attacks of the virulent microbes of the same species. Upon these three principles the successful preparation of microbic vaccines and their inoculation against disease into man or animals depends. Pasteur's method of protecting animals by vaccination was first proved in connection with fowl cholera, then in connection with swine erysipelas, and then in connection with anthrax.

Since the time of Pasteur there has developed another method of inoculation, and it will be well to discuss the two in conjunction in connection with anthrax.

Immunity from the disease may be either passive or active.

Active immunity is due to the direct participation of the inoculated animal, say a sheep, and depends upon increased cell activity.

Thus the inoculation of a sheep with a mild form of anthrax sets up a specific reaction on the part of the cells and tissues of the animal which confers upon it immunity from virulent anthrax. Pasteur's method, to be referred to later, is based upon the above phenomena.

Passive immunity involves no active generation of protective substances by the immunised animal. The latter is simply the recipient of substances formed in the body of another animal and transferred to the individual to be protected. These transferred substances, the so-called "anti-toxins," or "serums," are sometimes used in the immunization of sheep against anthrax when the method of "single inoculation" is used.

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* **Frankland: The Pasteur Memorial Lecture.**

Vaccination against Anthrax, Pasteur's Method.

Two vaccines were used. The "first vaccine" consisted of a broth culture whose virulence was so greatly diminished by heat that it would no longer kill guinea-pigs, thought it was still fatal to white mice.

After twelve days a second inoculation was made with the "second vaccine," which was of such a strength that it would kill guinea-pigs, but not rabbits.

Objections to this method are (1) that to confer immunity all sheep have to be mustered twice; (2) that in any sudden outbreak of anthrax, since the second inoculation does not take place till twelve days after the first, the onslaught of the disease cannot be withstood by vaccination.

Immunization by what may be termed "the Simultaneous Method."

This method consists of the preparation of (1) an "antitoxin" or serum; (2) a spore vaccine. Each animal is then injected with the serum on one side and with the spore vaccine on the other at the same time.

Animals which are selected for the preparation of serum are subjected to a preliminary treatment by Pasteur's method, then at certain regular intervals they are infected with increasing doses of virulent anthrax cultures. Finally the animals are bled and from the blood the serum is collected.

The spore vaccine is prepared from specially attenuated cultures, and is standardised (*a*) for virulence upon guinea-pigs and rabbits; and (*b*) for numbers by "plating."

This method has been developed by Dr. Eichhorn in the United States. In Australia a method of protecting sheep against anthrax, involving only a single inoculation, was for long practised by Messrs. McGarvie Smith and Gunn, but the details of the process have not been published.

Hydrophobia.

The terrible disease, hydrophobia, to the investigation of which Pasteur devoted the later years of his life, presented peculiar difficulties. It had been pointed out by Dr. Duboué that the seat of the disease was the nervous centres. But no actual microbe of hydrophobia had been discovered; the exciting cause of the disease was unknown. Pasteur conceived the idea of communicating the disease by taking the nerve tissue of an animal which had died of hydrophobia and introducing it into the central nervous system of the animal to be infected. This proved to be the key to the situation, as it was found that in this manner the virus could always be certainly conveyed from one animal to another. Pasteur next devised means of attenuating the virus and eventually established a method of preventing human beings who had been bitten by mad dogs from developing hydrophobia.

Pasteur's researches then have led us to recognise that diseases of animals may be produced by bacteria (as in anthrax), by viruses in which bacteria have not yet been discovered, even by the highest powers of the microscope (as in rabies or hydrophobia), and by protozoa (as in surra). When it is demonstrated that bacteria are the cause of a disease, the manner in which immunity can be conferred is indicated. A knowledge of the cause of disease is the guiding factor in the methods adopted for controlling and combating outbreaks, and is the basis upon which our quarantine regulations are framed.

The Pasteur Institute.

As a testimony to the magnificent researches of Pasteur and the great work he accomplished, there was founded on the 14th of November, 1888, the Institut Pasteur. Thousands of people suffering from bites from rabid animals, from all lands, have been treated in this institute, and the death-rate from this most horrible of all diseases has been reduced to less than 1 per cent. Not only in Paris, but in many cities throughout the world, institutes on the model of the original one have been set up, and are doing beneficent work, all arising from the genius and labour of one man. At the inauguration of the institute Pasteur closed his oration with the following words:—"Two opposing laws seem to me now in contest. The one, a law of blood and death, opening out each day new modes of destruction, forces nations to be always ready for battle. The other, a law of peace, work, and health, whose only aim is to deliver man from the calamities that beset him. The one seeks violent conquests, the other the relief of mankind. The one places a single life above all victories, the other sacrifices hundreds of thousands of lives to the ambition of a single individual. The law, of which we are the instruments, strives even through the carnage to cure the wounds due to the laws of war. Treatment by our antiseptic methods may preserve the lives of thousands of soldiers. Which of these two laws shall prevail? God only knows. But of this we may be sure, that science, in obeying the laws of humanity, will always labour to enlarge the frontiers of life."

Pasteur died on the 28th September, 1895, but his work did not end with his death, for he collected in the Institut Pasteur, which was raised as a memorial to his life's work, a band of able and well trained investigators imbued with the same spirit that animated his mind and soul.

CONCRETE MIXTURES.

GOOD concrete for ordinary building purposes can be made from mixtures of stone lime, stone and sand in the following proportions:—To each half cubic yard of stone and sand use half-bag of unslaked stone lime. The stone if broken to a 2-inch gauge will require about 4 cubic feet of sand to fill all the spaces properly. Cement concrete, made with the same quantity of stone and sand, requires 1¼ bags of cement. Walls of lime concrete require to be about 12 inches thick, while cement concrete may be half that thickness.—A. BROOKS, Works Overseer.

Fruit-drying.

W. J. ALLEN.

As a method of dealing with fruit of almost all kinds, drying is of much importance, and is certain to receive increasing attention during the next few years. Discouraging failures have no doubt occurred in the past, and there are consequently some who still regard the possibilities of profitable production with doubt; but during recent years orchardists at Government experiment farms and on private properties have had a good deal of success with this method of dealing with their fruit, and the quality of the article they have been able to turn out, and the prices obtained, have already led other growers to view the subject with interest. Indeed, the number of inquiries now reaching the Department suggests the possibility of a good deal of fruit being treated in this way in the near future, and provided reasonable care is exercised, there is no reason why advantage should not be taken of a process that is really inexpensive, to turn to advantage fruit that may otherwise be of little or no value.

It will be convenient at the outset to point out that those practically interested in fruit-drying may be divided into two classes:—

(1) Those situated in districts whence the bulk of the crop can be forwarded to the city or to convenient country towns for sale as fresh fruit, but who deem it wise to have some other means of dealing with portion of their produce when the prices obtained for their more regular lines are not satisfactory.

(2) Those who, being located too far from Sydney or other large towns to be able to market any but a small part of their crop while it is fresh, and then only under exceptional circumstances, must grow their crops with the definite object of marketing them as dried or otherwise preserved fruit.

It will be seen that this generalisation is largely geographical. The orchardists of the coast and tablelands, looking to Sydney as their principal market, are interested in drying only as a means of dealing with part of their produce when things are not satisfactory in other respects. Those who have been planting fruit trees on considerable areas of the irrigation districts of the interior, on the other hand, are doing so with the intention of drying a large part of their fruit, and probably of canning the balance.

It is noteworthy, too, that the climatic conditions favour those growers whose purpose it is to market their fruit dry. Coastal and tableland growers must necessarily employ evaporators, the humidity in the one case and the absence of high temperatures in the other being against successful air treatment. In the western districts, however, although the evaporator is desirable in that it ensures a more uniform product and a smaller percentage of failures, it is possible to produce a very good article by relying only upon the drying effect of the sun and wind.

How little attention has been devoted to this matter in New South Wales, is proved by the fact that, notwithstanding the many thousands of acres of land admirably adapted to fruits suitable for drying, and a climate suitable to the production of a really good article, the population of this State is dependent almost entirely upon other sources for dried fruits. In many interior districts the absence of moisture from the air permits the process of drying to go on almost uninterruptedly, and growers there have an advantage so substantial as to be an additional reason for the extension of the industry.

Dried fruits of all kinds usually bring very remunerative prices, the last few years having been exceptionally good ones for those engaged in this industry. One of the largest brokers handling dried fruits in Sydney is reported to have given it as his opinion that, when federated Australia is supplied, our sultanas will hold their own against the world, even in the London market, and that, compared with our best sultanas, the imported fruit is in every way inferior. This statement is borne out by the quality of the sultanas cured in Australia during recent years ; by all who have seen and tested them they are pronounced to be exceptionally good. Samples of these, placed side by side with the best imported sultanas have been exhibited from time to time, and the difference in quality has always been so great that even the most casual observer could not fail to be struck by it.

While, however the fruit-growers of the State have failed to avail themselves of the advantages of soil and climate with which they are favoured, there are indications that the matter is now being taken up with some earnestness in various quarters, notably as already mentioned in irrigation areas, where fruit-drying, as well as canning and jam-making, is destined to be an important feature. When it does attain the prominence it deserves, it will be found that well-grown fruit well cured will be productive of considerable revenue, and also furnish profitable employment for hundreds of people.

The Matter of Varieties.

It is only to be expected that this new factor in the fruit-growing industry should have some connection with the subject of varieties. There are, in every kind of fruit suitable for drying, certain varieties that, though excellent as dessert fruit, do not dry well. One of the main objects in drying is to produce an article of good size and of bright, clear colour—in other words, there must be a minimum loss of weight and an attractive appearance when presented to the public. How these characters vary may easily be illustrated. Among peaches, Shanghai Seedling and Wiggins are good dessert varieties but valueless for drying, while Elberta and Early Crawford both yield attractive and fine-flavoured dessert peaches that also give a good dried product. Among apricots, again, Newcastle has much to recommend it for dessert purposes, but it cannot be compared with Moorpark as an all-round variety. The illustrations could be extended to other species of fruit, but enough has been said to show that any intention to market part of the crop in the form of dried fruit, should circumstances be favourable, must have some effect upon the varieties that go to make up the commercial orchard. Indeed, the modern orchard must be planted with a clear idea of the purpose to which the produce is to be put. These are times of keener competition than fifty or even twenty-five years ago, and it is not enough now to know that so-and-so is a good peach or a good pear; the point is to know what it is good for. The orchardist must not only make a selection of varieties that will enable him to market his crop in more than one form, if need be, but must ascertain which are the best for this and for that purpose, or for both. These are good for dessert—well, plant as many as can probably be disposed of in that way; those are good for drying—well, plant a few for that purpose; and for the rest, let a proportion at least be such as are suitable for both purposes. The time of the ripening of the crop must also be kept in view, for, whether growing for dessert, for drying, or for canning, it might be disastrous to have the whole crop ripening at one time.

In the foregoing it is the orchardist in those districts where dessert fruit is largely grown that is chiefly in mind, but the remarks have some application, also, to the grower of the western districts. His varieties must necessarily be of the sort that dry and can well, and that ripen in succession, but a proportion at least should be such as will sell well as dessert fruit should occasion suggest the advisability of marketing part of a crop in the city or some country town.

The Object of the Process.

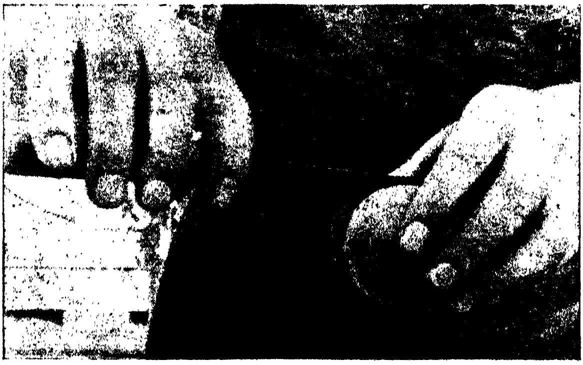
The object of drying fruit is the evaporation from the fruit tissue of the natural moisture, so that those low forms of life that would otherwise attack and decompose the organic matter may be unable to do so. It is true that, even after the process, there remains in the fruit a certain amount of moisture, but the process—whether the sun or the artificial evaporator is the drying agent—is effective enough, as is attested by the fact that dried fruit can be kept for months in perfect condition. Chemicals that possess antiseptic qualities, but that are not harmful to the consumer, are sometimes used to assist in the process of preservation, but they are not recommended in the following pages. Whatever the details of the process, however, the object is the presentation of the fruit to the consumer in such a condition that, when water is again added to it, the appearance and flavour shall be attractive when it is placed on the table. To preserve those two elements—appearance and flavour—demands careful attention on the part of the grower, but, given this, a fair product can be obtained without a great deal of technical knowledge.

The loss of weight in the production of dried fruit depends to a large extent on the skill displayed in handling the fruit and on the nature of the season. The following figures indicate the loss that may be expected on different classes of fruit:—

For 1 lb. of dried prunes, approximately 2½ lb. of green fruit is required.
For 1 lb. of dried apricots, approximately 4½ lb. to 6 lb. of green fruit is required.
For 1 lb. of dried peaches, approximately 5 lb. to 7 lb. green fruit is required.
For 1 lb. of dried apples, approximately 6 lb. to 7 lb. green fruit is required.
For 1 lb. of dried pears, approximately 5 lb. to 6 lb. green fruit is required.
For 1 lb. of table raisins, approximately 3 lb. to 4 lb. grapes is required.
For 1 lb. of lexias, approximately 3½ lb. to 5 lb. grapes is required.
For 1 lb. of sultanas, approximately 3½ lb to 5 lb. grapes is required.
For 1 lb. of currants, approximately 3½ lb. to 4 lb. grapes is required.

CURING STONE FRUITS.

Stone fruits may be dried either in the sun or in an evaporator, though if anything the latter yields a more uniform and better sample. It must be borne in mind, however, that high grade dried fruit can only be produced from fresh fruit that is of good quality and of the right kind. What is required is a fruit that will not dry away too much during the process, and that will give a bright, clear coloured sample of good size. It may be said, therefore, that the drying of fruit begins with the growing of it.



Proper way to hold and cut Fruit for Drying.

From the time of planting the tree must receive the necessary care and attention to enable it to produce a good crop of the very best fruit, for both quality and size. Undersized fruits are more expensive to handle, they lose more in drying, are more difficult to dispose of, and they sell at about one-half the price of fine, bright, even fruit. This necessitates systematic and judicious pruning and thinning. If it is seen that a tree has set too much fruit, or more than it can possibly develop properly, pick off or thin evenly over the whole tree, leaving only such quantity as the tree will properly develop.

This thinning, in the case of apricots, should be done during the latter part of October, and if the grower finds that there are still too many left on the tree, he may, if he thinks advisable, remove more just when the stone in the fruit is hardening, either the first or second week in November. It is not unusual for some of the fruit to drop at this period, in which case the second thinning may not be found necessary.

If irrigation is carried on, and the climate is very dry, do not be afraid to irrigate the trees at the time of ripening if they appear to require it, as a little moisture at this particular time may make a great difference in the quantity and quality of the dried fruit. Experiments in California have shown that irrigated fruits do not dry away as much as non-irrigated. In an experiment irrigated apricots took $4\frac{9}{10}$ lb. of fresh to make one pound dried, whilst non-irrigated took $5\frac{6}{10}$ lb. to make one pound dried. Some varieties, of course, dry away more than others; the above experiments were made with the best drying varieties.

The orchardist should also pay particular attention to the cultivation in order to keep the soil in proper tilth, for in that condition it retains the greatest amount of moisture necessary for the well-being of the tree, and the production of fruit.

Apricots.

To make the best dried product, allow the apricots to hang on the tree until they are perfectly ripe, but not over ripe. Where it is intended to cure the fruit in halves, they can be picked when the fruit cuts easily with a sharp knife and still retains its shape.

Proper position to place fruit on the trays for drying purposes.

In harvesting apricots for drying in California, the practice is to spread a sheet large enough to cover the ground under the tree. Each sheet is handled by a gang of four men. The tree is then slightly jarred with forked poles, one carried by each man, and when all the ripe fruit has been shaken, the sheets are taken up and the fruit is gently poured into cases, holding about 35 lb. each. With a large staff of about 30 pickers and 100 pitters, apricots can be cut and in the fumigator two hours after they are shaken from the trees, so that any slight bruises are not noticeable on the dried fruit.

The method generally adopted here is to pick the fruit carefully into cases when it is fairly soft, as in that condition it makes the best dried article. This will probably necessitate going over the trees several times. As soon as possible, cart the cases to the cutting-shed where, if the fruit is not to be dried whole, it should be carefully and evenly cut in halves (not pulled apart), and the pits removed. Place it evenly on the trays with the cut side up, and as soon as possible remove each tray to the fumigator, where it may remain, with the door closed, until the fumigator is sufficiently full to start the sulphur burning. This is of the utmost importance, as when once the fruit has been cut it must not be exposed to either sun or wind; otherwise its appearance will be spoiled.

When everything is ready, put in the burner sufficient sulphur or brimstone′ to fill the room with the fumes for about three hours; this means appproximately 1 lb. to 200 cubic feet of room space. If possible allow the fruit to remain in the sulphur-room from eight to ten or twelve hours, or until the cup (that is, the depression whence the pit was removed) is full of juice. It can then be taken out and immediately placed in the sun or in the evaporator, as the case may be. If the fruit is being treated in the evaporator, do not place it in the hottest part to begin with, but gradually work it from the cooler to the hotter part. In this way the fruit will dry in fourteen to eighteen hours; but the greatest care must be taken not to allow it to burn, and some practice will be required to tell when it is just dry enough. It would be as well to make a test in order to ascertain what gives the best result with the particular fruit that is being processed. The greater the heat of course the shorter will be the time required for drying.

If the fruit is to be cured in the sun, it should be taken from the fumigator on the trays and placed on the drying ground. In hot weather, such as is usually experienced about Christmas time, it will take from two-and-a-half to four days to dry the fruit. Before removing it from the trays any fruit that is not sufficiently dry should be removed to other trays and allowed to remain in the sun until in a condition fit to be packed. The dried fruit should then be taken from the trays and immediately put into either properly-made sweat-boxes or clean calico bags. Fruit that is small or of bad appearance should not be mixed with the good, but should be removed and stored in separate boxes or bags, and marked as inferior. The fruit should then be at once stored in a cool, dry place, as if exposed to heat it will become hard, lose weight, and deteriorate in quality.

The danger that dried fruit may be attacked by moths which lay their eggs in the fruit and leave them there to hatch (the larvæ attacking the fruit when they hatch and depreciating its value), makes it necessary for the grower to take special care to box or pack his product in such a way as to exclude the moth altogether. The practice of sending the fruit in sweat-boxes to the packing-house is perhaps satisfactory when the product is going to be packed immediately, but where it is necessary to hold the dried fruit for some time before packing, the calico bags are much more effective in excluding the moths than are sweat-boxes. Orchardists, perhaps, hesitate at the expense, but the wisdom of the method has been proved at each of the Department's orchards where curing has been carried out.

If, by any mischance, moths have got into the fruit and have deposited their eggs there, an effectual means of cleaning or ridding the fruit of the infestation is to dip it into boiling water for a few seconds, and then spread it on trays and allow it to dry by exposure to the sun's rays for a few hours. Fruit thus dipped will not keep its colour long, and should be disposed of as quickly as possible.

Drying Apricots Whole.—Of late years it has become somewhat popular to dry apricots whole, *i.e.*, without cutting them in halves as had always hitherto been done. The method is a quick and easy one, and is therefore adapted to growers who have large crops to deal with, particularly since it has been proved by experiment that when dipped in a strong caustic soda solution the apricots dry much quicker and make a better sample that when the immersion is omitted. The solution is made up of 1 lb. of caustic soda to 8 gallons of water, and must be kept as nearly as possible on the boil. The fruit must be dipped in and out smartly and then spread out on trays, and transferred to the fumigator in the usual way. Less sulphur can be used where the fruit has been dipped, as above described, than with fruit that has not been dipped; one grower's statement is that "about half the usual amount of sulphur is likely to prove sufficient." Whole fruit dipped and dried without sulphur, becomes dark in colour, and gets darker as it gets older, even after the drying is complete. On being removed from the fumigator the trays should be stacked on top of one another, to protect the fruit from the sun, as otherwise it blisters somewhat readily. This curing in the stack is a little more expensive and somewhat slower, but it is quite worth while having regard to the sample produced.

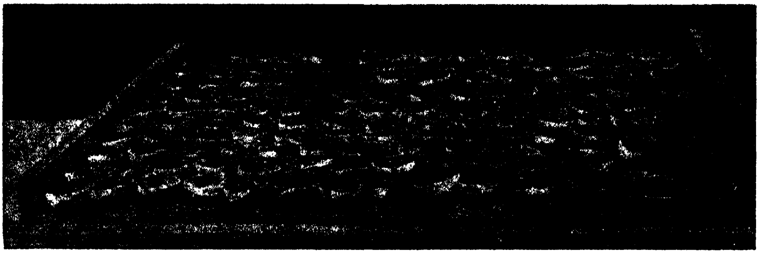
Peaches.

The process of drying peaches is very similar to that adopted for apricots. There are many poor varieties grown, but there also are many that make a first-class commercial dried sample. A freestone variety, with a firm, yellow flesh, not too juicy, and above medium size, ripening from the middle to the end of the season, is really most suitable for the purpose. A peach of this description will make the very best commercial article, and when properly dried and packed, it will bring the highest price. A clingstone peach will dry, but will not sell so readily, and brings a much lower price. It is true it will not dry away so much, but with the market as it is, and with keen competition from America, it will not, for the following reasons, pay the grower to place an inferior article on the market: (1) Inferior quality fruit tends to lower the prices of good fruit; (2) it sells at such low prices that it barely pays the grower for his work in picking, curing, packing, and marketing; (3) it is usually the last to be sold, and very few wholesale dealers care to handle it at all.

Varieties that are specially worthy of notice for the purpose have been frequently mentioned, but it is not out of place to again refer to a few that are largely used:—Elberta, Lady Palmerston, Early Crawford, Late Crawford, Salwey, and any other large-sized, yellow-fleshed, freestone variety which ripens in January, February, or March.

Although in California peeled peaches have always brought a much higher price than unpeeled, they have not, in Australia, sold for sufficiently more to pay the grower for the extra labour, and in consequence nearly all dried peaches found on the market are unpeeled. With some varieties it is found that immediately after the fumigation, if the fruit is perfectly ripe, the skin may be removed quite easily with a slight pressure of the thumb and finger, but other varieties can only be peeled by means of a peach-peeling machine, in which case the work should be done before they are placed in the fumigator.

For drying, peaches should be cut evenly in halves, placed on trays with the cut side up, and treated in every way similarly to apricots, except that, at most, they only require two hours fumigating; if desired, they can remain for a longer time in the sulphur-room, the doors being opened and the air allowed to circulate freely through the trays. From the fumigator the trays are placed in the evaporator or in the sun, as the case may be, and exposed to the same temperature as mentioned for apricots. They should be removed from the trays while quite pliable, and not allowed to become over-dry, then placed in sweat-boxes or tied in calico bags, and stored in a cool, dry place until ready to pack. If the peaches are very uneven in size it is best to keep the different sizes separate on the trays, as they then dry more evenly than if large and small fruits are mixed on the same tray.



Tray of Peaches ready for fumigating.

Nectarines.

This fruit is handled in a similar manner to the peach. I have seen them peeled, but, as they then dry away considerably, the general practice is to dry without peeling.

Prunes.

In the Departmental orchards, Prune d'Agen and Robe de Sergeant have proved the two best varieties for drying purposes. There are one or two other varieties that are being grown at Batlow and in other cool districts, the fruit of which makes a good commercial article, but the two mentioned are those most largely planted, as they are in every respect suitable for the purpose. In some districts, particularly in warm ones, Robe de Sergeant has proved a better variety than Prune d'Agen. The trees are more abundant croppers, the fruit ripens earlier, hangs better during dry seasons, and has the advantage of being suitable for both dessert and cooking purposes; the dried product when ready for market has also a more attractive appearance. That has been the Department's experience at Wagga and Yanco, where it has been found that Robe de Sergeant commands higher prices than Prune d'Agen. The skin of Robe de Sergeant is, however, somewhat softer than that of Prune d'Agen, and may therefore easily be cracked too much if the caustic soda solution is too strong or the immersion at all too long.

In the cooler districts, such as Bathurst, both kinds do well, while the manager of Kameruka orchard, near Bega, tells me that Prune d'Agen is superior to Robe de Sergeant. It will be seen that it is as well to make some inquiry as to which variety is doing best in the district before planting out an orchard.

For drying purposes, prunes should not be picked until fully ripe. The fruit has first of all to be dipped in a solution of caustic soda. This solution consists of 1 lb. caustic soda to 12 to 20 gallons of boiling water, according to the strength of the soda; Greenbanks is a very well-known brand, and as it is somewhat stronger than the ordinary caustic, up to 20 gallons of water will be required for its dilution. The fruit should be allowed to remain in the solution for from three to ten seconds, or just long enough to slightly crack the skins. Indeed, the length of time it should be left in the solution depends upon the toughness of the skin; some varieties have softer skins than others, and Robe de Sergeant, as stated above, may easily be damaged if left in the solution too long. If the skins are cracked too much they present a very rough appearance when dry, and the fruit is liable to go sugary, in which event the finished product cannot be classed amongst the best grades, and would have to be sold at correspondingly low prices.

Dipping Prunes and Sultanas at Wagga Orchard.

After immersion in the caustic soda solution, the fruit is spread on trays to dry, and silver or light-coloured prunes should be put into the fumigator for just long enough to set the colour. After the sulphuring, the prunes should be placed in the sun or evaporator, as the case may be. In the latter event, the temperature should be about 120 degrees to start, and should be gradually increased to 180 degrees; this usually occupies from one to two days, according to the size of the fruit. If the temperature is too high when the fruit is placed in the evaporator, the prunes are liable to burst, and the juice to run and stick to the trays and other prunes.

The length of time required to dry prunes will, of course, vary. But they should be exposed to the sun—or, in the case of the evaporator, to the artificial heat—until they are thoroughly dry, though they should still be quite pliable. In the evaporator, the smallest are sometimes dried in a day, while the largest take two days. Indeed, it is unlikely that all the fruit will dry evenly, and this necessitates sorting the finished from the unfinished product, so that the former can be withdrawn from the processing and the latter further treated. In California this work is done by mechanical means. A combined grading and dipping machine is used to grade the fruit according to size, and as the tendency is for the larger fruit to dry more slowly, the necessity for sorting it by hand is to a large extent obviated.

When thoroughly dried the fruit is usually placed in sweat-boxes for three or four weeks, care being taken to turn it at least once a week during that time. Finally, the fruit is dipped for about five minutes in boiling water, to which has been added a little salt and a quantity of broken or damaged prunes. After this it is again dried and is then ready to be placed in sweat-boxes in which it can remain until it is convenient to grade it and pack it neatly in the 28-lb. boxes generally used for the purpose. The presentation of the product in an attractive manner is important, and lining with clean white paper is one of the methods to that end. It is common in some districts, however, for growers here to send their product in sweat-boxes to a packing house where the last operations of packing for market are carried out.

The classifications usually adopted in grading are 20 to 30's (per pound), 30 to 40's, 40 to 50's, &c., up to 120 prunes to the pound.

Processing Prunes for Dessert Purposes.—At Yanco Experiment Farm prunes are prepared for the table by a process very similar to the foregoing.

Robe de Sergeant prune is gathered when fully ripe by being shaken off the tree on to hessian sheets and cured in the usual way. It is dipped for a few seconds in a solution of caustic soda (approximately 1 lb. caustic soda to 20 gallons of water), then exposed to the sun, and when dry it is placed in sweat-boxes for about a fortnight and turned about frequently until it has sweated up evenly. It is then graded to size and packed in 2 lb. lacquered tins, with "push-in" caps. Before being packed, about one tablespoonful of water is added to each can; they are then placed in a retort and cooked for one hour under 6 lb. pressure of steam. It is advisable to tip the lids on opposite sides with a little solder to prevent them from lifting whilst being cooked. As soon as the tins are taken from the retort they are turned upside down to bring the top layer of the fruit in contact with the lid. The effect is to press it, and give it a polished and finished appearance that commends it to the consumer when he opens the tin.

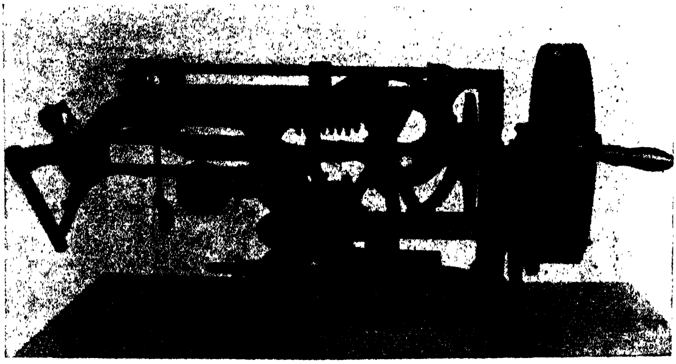
CURING POMACEOUS FRUITS.

For the drying of apples and pears there is no special variation of importance from the method for drying stone fruits already described. Apples being grown for the most part in cooler districts, are usually cured in an evaporator, but providing care is taken to fix the colour there is no reason why sun-drying should not be a success. The fruit having been peeled, cored, and sliced, should be dropped into a weak brine solution to prevent loss of colour and appearance, and from there transferred to the fumigator. The finished article should be quite tough, but still pliable in the hand. As showing the amount of moisture that remains even in the dried product, it may be said that in the State of New York, U.S.A., the sale of adulterated evaporated apples is prohibited, and the effect of the law is that the apples are considered to be adulterated if they contain more than 27 per cent. of moisture.

Pears are grown in a wider area as to climatic conditions, and sun-drying is practised more than in the case of apples.

Apples.

With the exception of a few of the very juicy kinds, nearly all varieties of apples yield a dried product of a marketable quality. The most suitable, however, are the larger cooking varieties that have a firm, white flesh, such as Dunn's Favourite (Munroe's Favourite), Rome Beauty, Granny Smith, &c.

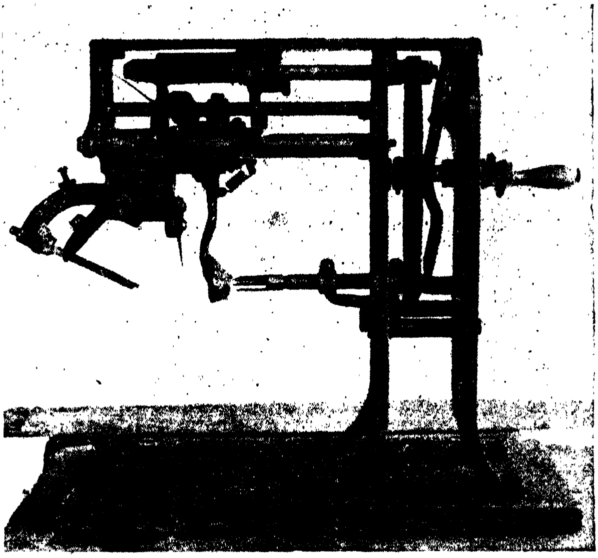


A class of machine suitable for peeling and coring Apples—run either by hand or power.

The fruit requires to be peeled, cored, and sliced before it is dried, and for this purpose some machine of a reliable kind is required. There are on the market several machines of satisfactory make that perform all three operations at one time, but others peel and core only, the slicing having to be done by another machine. In the latter case the fruit should be sliced either immediately before or after sulphuring. In passing through this machine the peeled apples should be set on end, and the slices cut about a quarter of an inch thick and at right angles to the hole in the centre.

Following this preparation, the fruit should be examined and any bits of skin or other defects removed by hand. To prevent discoloration the apple should then be immersed in a weak brine solution, consisting of 2 oz. salt to a gallon of water. In this brine the fruit may remain for some little time while sufficient is being accumulated to fill several trays; it should then be quickly spread out on the trays and placed in the fumigator, where it should remain just long enough to set the fruit a nice colour. Usually from ten to fifteen minutes is required, but great care must be exercised at this stage, as if the fruit is left too long it becomes strongly flavoured with the sulphur, and consequently of very little value.

Fruit that has not been dipped in brine should be subjected to the sulphur for about twenty minutes. Such fruit discolours rapidly, however, and should not be exposed to the air for any length of time before being placed in the sulphur room.



Another efficient peeling, coring, and slicing machine.

Apples are not usually sun-dried, and therefore, after being bleached, the fruit is generally placed in the evaporator and allowed to remain there until perfectly dry; usually this takes from six to eight hours, the temperature ranging from 120 to 160 degrees, or even higher towards the finish. The fruit must not be permitted to burn or bake, as it would in either case harden as soon as exposed to the air. When properly dried, it should feel soft and pliable to the touch. It is then put into sweat-boxes, and allowed to stand for a few days so as to even up. Care must now be taken to protect the dried fruit from moths as otherwise they will deposit their eggs among it. If the fruit is to be stored for any length of time before packing, it is always best to keep it in securely tied calico bags, or very tight boxes.

Pears.

Pears must be perfectly ripe for drying. If the skins are to be removed the fruit is either peeled by machine or dipped for a few seconds in a boiling solution of caustic soda, consisting of 3 oz. caustic soda to a gallon of water. After immersion in this solution, the fruit should be placed in cold water, when the skin may be easily removed by hand or by means of a brush. If the fruit is thoroughly ripe, a few seconds in the caustic solution will be sufficient, but if on the green side, it will take some seconds longer, and may be more difficult to peel. Cut the fruit in halves, remove the cores with a sharp knife or spoon, sulphur, and proceed as with apples.

FIGS.

The fig is only fit for drying when it is dead ripe, and if dried when only partially ripe the fruit will be found worthless, and possessing none of the rich flavour which characterises the well-developed and ripe fruit. The varieties which have been found to bear fairly well, and make good dried fruit, are White Adriatic and White Genoa, the former being considered to yield the better dried product.

The Smyrna fig, as grown in Smyrna, makes the best dried article; but we have only made a start with it, having but recently introduced the Fig wasp. Up to the present this variety has not proved a success in this State. It has not borne very satisfactory crops, and has shown a lack of the robustness possessed by some other varieties.

In picking the figs, care should be taken to retain the stalks. The first treatment is to dip the fruit in a caustic solution, composed of 1 lb. caustic soda (if Greenbank's is used) to 25 gallons of water, the object being to break the skin almost imperceptibly in order to allow the moisture to escape. The figs may then be placed on the trays with the bloom end down, and sulphured for about twenty minutes. The appearance of the figs is improved by the sulphuring, but over-sulphuring is common. The figs should only be exposed to the sulphur fumes for just long enough to set their colour immediately after they are dipped, and before they are exposed to the sun or placed in the evaporator. Figs which are not quite ripe require a longer exposure than those that are fully ripe.

The fruit is then exposed to the sun for two or three days, after which it should be turned. If picked when properly ripe, it should not take longer than five days of our ordinary summer weather to dry the fruit, but the figs must not be allowed to get at all hard, and should be removed from the trays while quite pliable.

After the figs have been dried, it is well to place them in a tight box with a weight on the top to press them firmly together, as by this means they will be brought to a uniform condition. In a week's time they will be ready for packing, but they should first be immersed in a weak brine consisting of 2 oz. salt to a gallon of water; this should be kept just on the boil. The effect will be to assist crystallisation and to improve the appearance of the product. In packing, the figs should be well worked out between the thumb and finger, and packed in boxes or drums holding from 1 lb. to 28 lb.

DRYING GRAPES.

Grapes of all classes are usually dried in the open air rather than in the evaporator. The former gives a more uniform and better sample, while the latter process is both slow and costly. In wet seasons, however, the evaporator may be requistioned even for grapes, though, by using covered racks, this difficulty may be largely overcome. There are times, chiefly late in the season, when owing to damp nights and cold days, it is impossible to finish the drying properly in the open air, and it is then that even the grape grower will find the evaporator almost an essential.

Of recent years, drying racks have to a large extent superseded trays for drying currants, sultanas, and even lexias. They are more economical and turn out a superior article to that dried on trays in the sun. In the case of currants, however, the method that eclipses all others as far as the quality of the product is concerned, is to stack the trays containing the fruit on top of one another, and by this means to allow the fruit to dry slowly without direct exposure to the sun. The drawback to this method is that the cost is considerably increased by reason of the large number of trays required.

Table Raisins.

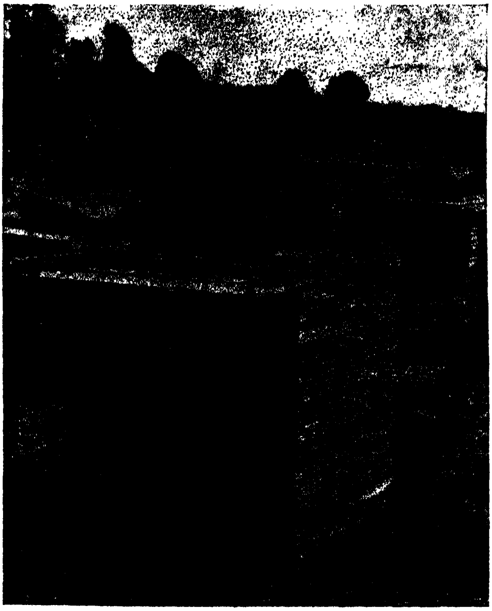
It will be found that the best raisin grapes are grown on the lighter and richer soils, and I have never yet in Australia seen a first-class raisin made from grapes grown on a stiff soil.

To make a good table raisin, the grapes must be grown to perfection—that is, the grape when ripe should be large, thin-skinned, fleshy, and containing plenty of sugar, and the bunches must be well filled. The larger the berries and clusters, the better the appearance of the dried article will be.

Picking grapes for either pudding or table raisins should be delayed until the fruit is perfectly ripe. For the latter purpose especially, an unripe grape is most unsuitable. When exposed to the sun they will turn red, will take longer to dry than ripe grapes, and the finished product will be sour and of inferior quality. My experience with regard to picking is that in nine cases out of ten the inexperienced grower imagines that as soon as the grapes are sweet enough for eating they are ready to pick for raisin making, and, contrary to all advice, he will start picking only to find at the end of the first week that the grapes are not turning a good colour.

The grapes which have so far produced a good commercial raisin in Australia are Gordo Blanco, Muscat of Alexandria and Waltham Cross, (sometimes known as Eleme). I have had samples of raisins sent to me made from other kinds of grapes, which presented a fair appearance, but if the grower placed these on the market to compete with the raisins made from the above-mentioned varieties, he would find that they would not sell, so long as the latter were obtainable.

The process of curing the table raisin is as follows:—Pick the very best clusters—that is, only such as are well filled with large, fine grapes—cut out all damaged or hard grapes, and lay the bunches carefully on trays, which should be then placed in the sun. By the end of the first week one side should be fairly well dried, and the bunches should be turned. This may be done by placing an empty tray on top of the full one. Two men can then take hold of the sides and invert the two, thus exposing to the sun the side of the fruit which has been lying next to the tray. After this turning it usually requires about another week to finish the drying process, if the weather is favourable. If the weather is damp or cool, it will, of course, take longer, and it is better to stack up the trays at night, covering the stacks with empty trays. If a table raisin gets wet during the curing process, the stem gets dark and the bloom spoiled, and the grade is lowered and the value of the fruit depreciated.



Proper way to stack trays during wet or hot weather.

Table raisins require to be dried slowly, and it is doubtful whether the evaporator will ever prove satisfactory for curing them. Even when dried in the sun, a higher temperature than 96 degrees will cause them to burn and will spoil the sample. At the very most, they should not be exposed to a higher temperature than 110 degrees in the evaporator, and it is probable that green fruit would be damaged by even that degree of heat. Consequently the cultivation of raisin grapes cannot be recommended in districts where the evaporator would have to be resorted to for curing them.

Pudding Raisins or Lexias.

Grapes intended for this purpose should also be picked when fully ripe. All partially ripe and dried fruit should be removed, and the grapes then immersed for about three seconds in a lye made in the proportion of 1 lb. of

Greenbank's caustic soda to 20 gallons of water. To turn out a raisin of good quality and appearance, the dipping solution should be kept at almost boiling point; if allowed to cool much below this, the fruit, instead of being a nice golden colour, will be a brown.

Other factors than the heat of the dipping solution may cause raisins to turn brown. For instance, it is impossible to make a good bright lexia, or a good quality of raisin of any sort, from grapes grown on some of the heavier or stiffer soils.

It is a good plan to dip the fruit in the morning, or early afternoon, in order that it may have time to dry off before evening. Drying usually occupies from five to eight days, according to the weather. If dried on trays, it will be necessary on about the fourth day after dipping to turn the fruit, and care will have to be exercised to see that it does not become too dry before it is taken in. A nice pliable fruit is always the best. Should there be any uncertainty as to whether the fruit is sufficiently dry or not, it can be tested by squeezing a few of the raisins between the thumb and finger; if no moisture exudes, then the fruit is quite dry enough. Lexias should be stemmed and graded as soon as possible after they are sufficiently dry to be removed from the tray to the sweat-box. If allowed to stand any length of time the stem becomes toughened and difficult to separate from the raisin.

Sultanas.

For drying purposes sultanas should not be picked until fully ripe. A very common error, and one that greatly lowers the quality and the value of the dried product, is to pick the fruit too soon. Grapes that are apparently quite ripe and ready to pick for eating purposes should usually be left for at least another fortnight if they are to be dried. When they are of a clear amber colour, and perfectly sweet, without a trace of acidity in any of the berries, they should be about ready to pick. The last fortnight, before the fruit has attained this stage, adds considerably to the sugar content, and as this means increased weight and a better quality product, it is best not to pick until the fruit is dead ripe. As soon as possible after picking, the fruit should be dipped in a caustic solution.

For sultanas, this should be made at a strength of 1 lb. of Greenbank's caustic soda to from 15 to 20 gallons of water—the exact quantity of water depending upon the toughness of the skin.

The fruit should be dipped while the lye is almost at boiling point, but should not be immersed for longer than two seconds, or long enough to slightly crack the skin. The grapes should then be spread out thinly on drying racks, or on ordinary drying trays, and exposed to the sun. When trays are used, the fruit should always be turned the day after dipping. If the nights are cool, or rain threatens, the trays should be stacked up, and the stacks covered with empty trays, so that the fruit cannot be damaged. If the weather is very hot, the trays may be stacked up and allowed to remain thus until the sultanas are dry. Drying racks, where used, are usually provided with side curtains, which may be drawn to shelter the fruit from the direct rays of the sun.

Under no circumstances should sultanas be exposed to too great a heat, as this will spoil the colour of the dried article and lower its value on the market.

To realise the best prices, it is essential to produce a dried fruit of bright colour and high quality, and this may only be done by picking the fruit when dead ripe, dipping it carefully, and allowing it to dry slowly.

Zante Currants.

The Zante currant is very easily cured. In this case also, the fruit should be allowed to hang until it is well coloured, and thoroughly ripe—that is until some of the currants on the bunches have begun to shrivel. It may then be picked and placed on drying racks or trays as the case may be. Four or five days' exposure to the sun will usually dry the fruit so that it may be bagged, but should the temperature exceed 90 degrees in the shade, the trays should be stacked until the weather is cooler. In the case of drying racks, the curtains should be drawn to shade the fruit from the direct rays of the sun. As this fruit is liable to become moth-infested if exposed too long, it is advisable to bag it immediately it is sufficiently dry, and it is wise to leave it in these bags until it is stemmed and properly packed.

"NATURE IN FARMING."

"IT used to be considered that anybody could be a farmer. . . . . Far-seeing men outside of the farming community now recognise, however, that to farm effectively the farmer must be well informed."

The opportunities afforded to-day for the acquisition of the knowledge essential to successful farming are annually increasing in number and in efficiency. The latest is before us in the shape of a little book with the suggestive and attractive title "Nature in Farming." Dr. J. W. Paterson, its author, is Professor of Agriculture in the University of Western Australia; formerly he was an officer of the Victorian Department of Agriculture, and previous to that again he was a member of the professorial staff in the West of Scotland Agricultural College. To farmers it will be re-assuring that the author spent eight years of his life farming.

In clear, concise and direct fashion, the book states the principles of agriculture and the bearings upon the practice of farming of such sciences as physics, chemistry, botany, microbiology, and so forth. "The book aims less at describing how things may be done than *why* they are done," and this line of treatment has been followed deliberately, it being (the author remarks) "less important to remember facts than to understand principles."

The 213 pages, liberally illustrated, are divided into fifty brief chapters so arranged as to be of value for reference by students and yet of distinct assistance to farmers. The work may be recommended to the latter as in some degree a handy companion to "The Farmers' Handbook."

A preface by his Excellency Sir R. M. Ferguson, Governor-General of Australia, approves the lucid treatment of the wide range of subjects, and points out that "only a knowledge of the underlying principles of agriculture will enable the farmer to cope with the varying problems peculiar to agriculture in the several States."

[Published by Lothian Book Publishing Co., Ltd., Melbourne and Sydney.]

AUCTION PRICES OF VARIOUS CROSSES OF LAMBS FOR EXPORT.

On Monday, 4th December, a further draft of crossbred lambs from the trials which are being carried out by the Department of Agriculture at different experiment farms, was sold by Messrs. Badgery Brothers at Flemington. This represented the final draft forwarded for testing on the Sydney market this season, as one lot has already been received from Wagga and two lots have been sold from Cowra. In each instance highly satisfactory prices have been realised, the last lot ranging to as high as £1 8s. 6d. per head; in fact, fourteen lambs were sold at this figure, sixteen at 28s., the lowest price realised being £1 0s. 2d. This third lot from Cowra were somewhat lighter than previous drafts from this farm, and were the result of protracted lambing.

Interesting records were taken as to the loss of weight in transit, as will be seen from the following table, which also shows the prices realised for the different crosses:—

Cross.	Weight.		Price.	
	At Farm.	At Homebush.		
BATHURST EXPERIMENT FARM.	lb.	lb.	s.	d.
Southdown x Lincoln-Merino	74¼	70½	25	0
Southdown x Leicester-Merino	75½	71½	26	7
Southdown x Border Leicester-Merino ...	79½	69¼	28	6
Shropshire x Lincoln-Merino	79½	70¾	26	2
Shropshire x Leicester-Merino	81½	72¾	27	10
Shropshire x Border Leicester-Merino ...	81	70½	26	7
Dorset Horn x Lincoln-Merino	82¾	75¼	27	4
Dorset Horn x Border Leicester-Merino	80½	73¾	28	0
Dorset Horn x Leicester-Merino... ...	81¼	72½	25	11
COWRA EXPERIMENT FARM.				
Southdown x Lincoln-Merino	63	55	20	3
Southdown x Leicester-Merino	67	59	20	2
Southdown x Border Leicester-Merino ...	70¾	62¼	23	5
Shropshire x Lincoln-Merino	69¾	61	22	7
Shropshire x Leicester-Merino	67	57¼	21	1
Shropshire x Border Leicester-Merino ...	67	60	22	5
Dorset Horn x Lincoln-Merino	78¼	69¼	25	0
Dorset Horn x Leicester-Merino	66	59½	25	0
Dorset Horn x Border Leicester-Merino	70½	60¼	25	0

It is the intention of the Department to test the market for different crosses as long as the present series of experiments are in progress—that is, for a further period of three years. Meanwhile, records are being taken to ascertain the value from a wool-growing point of view of the different groups of ewes from which the lambs are raised. The trials will, therefore, indicate not only which is the most profitable lamb for export requirements, but data will also be available as to aggregate value of wool and mutton in the different crosses.

The details of the two previous sales were published on page 851 of the December issue.

Wagga Growing-crop Competition.

[The Murrumbidgee Pastoral and Agricultural Association, Wagga, in accordance with previous practice, held a growing-crop competition this season, and, with the approval of the Minister, Mr. H. C. Stening, Inspector of Agriculture, acted as judge. The following extracts from the report furnished to the President and Committee of the Association on the 20th November will be found of more than local interest.—ED.]

THE total entries for the best farm of growing crops numbered twenty-four, but of these only twenty-one were judged, three competitors having withdrawn on account of damage to their crops by wind and rain storms.

Owing to the exceptionally cool spring weather, combined with copious rains, the crops are this season maturing much later than normally, and consequently judging was not commenced until 7th November, and was completed on 14th November, a delay of one day being occasioned by rain. The total area of crops judged was 6,925 acres, ranging from 155 acres to 645 acres. The scale of points adopted for the judging of this year's competition differs in some respects from that used previously, and is, in my opinion, an improvement.

The Awards.

As the result of the judging, the prizes are awarded as follows:—

Best farm of growing crops: T. Hamilton, 142 points, 1; A. Lewington, 138 points, 2.

Best 100 acres of wheat, to be harvested for grain, and to be grown on fallowed land: A. E. Armstrong, 1.

Best 100 acres of wheat grown for hay: W. F. Stone, 1.

The whole of Mr. Hamilton's area was sown with Federation, with the exception of a headland border of Firbank amounting to about 5 acres, and all was well fallowed. Considering that at least twenty-five crops had been grown previously on the land, the crop was a credit to the grower, for it was remarkably clean and even throughout, and estimated to yield 28 bushels per acre. This competitor has a distinct advantage, however, by reason of the fact that he was able to give better attention to his comparatively small area, which just exceeds the minimum eligible for the competition.

Mr. Lewington, in gaining second prize with the largest area entered by any of the competitors, has put up a most creditable performance. Although his land has been under cultivation for a considerable number of years, it is scrupulously clean, demonstrating what may be accomplished by careful cultivation. The whole of his wheat crop, 350 acres of which was Federation, was grown on fallow, and was true to type and very even. The average yield of his wheat crops is estimated to be about nine bags. The stubble land, 200 acres in area, was all sown with Algerian oats, which are not quite as satisfactory competition crops as his wheat crops; but since take-all was present in some of his wheat crops last season, he is adopting a wise practice in spelling his land from growing wheat.

Special mention must be made of the crops exhibited by Mr. W. Schulz. From point of view of yield, there was nothing in the competition to approach them. His 270 acres of wheat crops were very uniform, and were expected to yield an average of close on 10½ bags per acre. He, however, lost points under other headings; his Federation crops were mixed with other varieties, and there was a good sprinkling of Cape barley and Algerian oats through the crop. His oat crop, which also promised a heavy yield, had badly lodged in patches.

Storms had also played havoc with Mr. A. E. Armstrong's crop of Zealand and Firbank, and thus destroyed his chance of a prize for the best farm of growing crops. He, however, has succeeded in winning the prize for the best 100 acres of grain crop grown on fallowed land with his ten-bag crop of Federation, which was very even, and exceptionally clean. Mr. Armstrong makes a practice of cultivating his land in the autumn, prior to fallowing in the winter, and this extra operation tells its tale with clean, heavy crops.

I had some difficulty in awarding the prize for the best 100 acres grown for hay, as most of the very heavy crops had suffered damage from storms. The decision goes in favour of Mr. W. F. Stone's crop of Marshall's No. 3, which should yield close on 3 tons of hay per acre and is "standing up" well, very even, and with very little undergrowth. The season has been an excellent one for testing the storm-resistance of varieties. Zealand, Firbank, and Gluyas Early suffered the most, some crops being so badly tangled that it will be difficult to do anything with them. Federation has upheld its reputation for standing up against rough weather, for there was not a single instance where this popular variety had been damaged in the slightest degree. Of the taller varieties, Yandilla King, Marshall's No. 3, Dart's Imperial, and College Purple have successfully resisted the wind storms.

Some recently introduced varieties have been grown by some of the competitors, and of these I wish to specially mention Warden, which as a hay wheat should prove a worthy rival to Zealand. It matures about the same season as the latter variety, stools very well, and possesses a fine straw which "stands up" satisfactorily and produces a heavy yield of hay of prime quality. In Victoria it also has a reputation as a heavy grain yielder.

Avoca is another promising dual-purpose variety of late maturity.

Apparent Yield.

As the result of the bountiful rains during the winter, the early-sown crops, when located on well-drained situations, have made luxuriant growth, and will return heavy yields. On low-lying ground or in depressions where water has lodged the crop is much lighter. The late-sown crops have also suffered from a superabundance of moisture, and are very thin and will not yield very satisfactorily. The abnormally wet and cold weather recently experienced, by delaying the ripening of the crops, should ensure the filling of the ears, resulting in a plump sample of grain.

Type.

On the whole there was an improvement in the purity of the crops inspected this year, although there were two or three notable exceptions, one crop in particular being quite a mixture of varieties.

Defects and Disease.

Wet seasons are usually favourable for disease attack. Rust has made its appearance among the wheat crops fairly generally, but at present is confined principally to the flag, while in a few instances the lower portions of the stem have been attacked. Whether the outbreak will prove serious depends upon the weather conditions, but I consider there is no cause for alarm, for although the recent rains supply one of the conditions favourable for the development of the fungus, I believe that the exceptionally cold and windy weather will be an important factor in efficiently checking the outbreak. Most of the crops also are too far advanced for any great loss to be occasioned, but in the event of warm, muggy weather, which will favour the rapid development of the disease, there is a probability that some of the late-sown crops of the late maturing varieties will suffer a reduction in yield. Take-all was the most prevalent disease, and in a few instances there will be great loss as a result of its ravages. Cultivating the land in a dry condition is to a great extent responsible for the development of the disease and the only means at present known to prevent it is to burn all diseased stubble, avoid cultivating land when dry, and spell infected paddocks from wheat for a couple of years by growing oats one year and fallowing the land the following year, the fallow to be kept scrupulously free from growth. The comparative immunity of oats to take-all was well demonstrated on some farms. Fine healthy uniform crops of Algerian oats could be seen growing in the same paddock alongside wheat crops, sown under similar conditions, badly infected with take-all.

There was also a fair amount of flag smut present in the crops, and as this disease is reproduced chiefly by diseased stubble similar precautionary methods as recommended for prevention of take-all, should be adopted. No stinking smut was encountered, but it does not follow that no crop was infected, for it is most difficult to detect until the crop has reached an advanced stage of maturity. However, farmers have an excellent weapon of defence against this disease by immersing seed in a 1½ per cent. solution of bluestone for three minutes.

This treatment is also effective in preventing loose (or naked) smut of oats, but there was only one competitor who had used it, and consequently most of the oat crops examined were smutty. Oats after pickling do not dry as readily as wheat, and it is well to warn farmers to be careful in this connection, for damp oats will not pass through the drill readily, and if kept in bulk in a moist condition will rapidly develop mould.

Loose smut of wheat, with which a few crops were badly infected, cannot be controlled by the treatment as prescribed for stinking smut. I had a few inquiries from farmers as to how it could be prevented. The hot water treatment is the only efficient method in checking the recurrence of loose smut. The grain should be soaked for four to six hours in water at a temperature from 68 degrees Fahr. to 86 degrees Fahr., followed by immersion in hot water at a temperature not below 122 degrees and not above 129 degrees Fahr. for ten minutes This treatment will also prevent stinking smut, but it is altogether too slow and cumbersome for ordinary farm practice. It may be of use, however, for the treatment of small lots of seed intended to be sown in seed plots.

Evenness.

The principal cause for reduction of points under this heading was the "lodging" of crops, caused by rain and wind storms. Most of the standing crops were remarkable for their evenness.

Cleanliness.

Considering the prolific seeding of all weeds last season, the crops entered in the competition were particularly free from weed growth. An extraordinary feature was the almost total absence this season of wild mustard, which was so prevalent in the crops last year. The abnormally wet season apparently was unfavourable for its growth, for adult specimens were seen that had decayed prior to the production of seed.

On two farms there was a good sprinkling of Algerian oats among the wheat crops, and in each case their presence was attributed to feeding the horses on oaten chaff during seeding operations. Horses cultivating land for wheat crops should be fed on wheaten chaff, which may be supplemented with crushed oats.

Cultivation Methods.

A little less than half the total area of crop examined was on fallowed land, while it is pleasing to note that in the case of five entries the whole of the wheat crop was sown on fallow. Considering that most farmers had nearly all their available cultivation land under wheat last season, the area of fallowed land is much larger than anticipated. By adopting a system of fallowing, the farmer is not only providing a reserve fund of soil moisture, but his land is in a condition to be sown at what is deemed the best period. Many farmers had their seeding operations hindered by the winter rains, which commenced to fall early in June, and consequently seed was "bogged in" during the months of July and August. Such late sowing is too great a gamble, for it is only under exceptional conditions such as were experienced this season that such crops are likely to pay for "the putting in and taking off," and it would be far preferable to allow such land to fallow for the subsequent season's crop. Late-sown crops are also more susceptible to stinking smut, and they mature at a period when they are subject to attacks of rust.

DETAILS OF AWARDS, WAGGA GROWING-CROP COMPETITION, 1916.

Name and Address of Competitor.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield.	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total Points.
	Ac.				lb.	lb.	Pts.		*	†	‡	§	‖	¶	
1. T. Hamilton, "Ruby Valley," Downside.	155	Federation, Firbank.	Fallowed July and August, cultivated before harvest, and again prior to sowing.	Mid-April to 1st week May.	50	45	..	25	28	18	19	19	29	29	142
2. A. Lewington, "Texas Farm," Uranquinty.	645	Federation, Currawa, Firbank, Zealand, Algerian Oats.	Whole of wheat crop (445 acres) on land fallowed July to September, cultivated before harvest and prior to sowing: 200 acres oats, sown on stubble land, autumn ploughed.	1st April to 1st June	Wheat 50, Oats 60.	56	..	Over 20.	26½	18	18	18½	29	28	138
3. W. Schulz, "Glen Illoc," Marrar.	315	Federation, Yandilla King, Algerian Oats.	230 acres fallowed June and July, scarified twice, harrowed twice, and harrowed after drilling; 85 acres autumn ploughed.	Early April to early May.	Wheat 50, Oats 60.	Wheat 45, Oats 28.	..	45 ac. 2nd crop; bal. 6th crop.	31½	16½	17	18½	26½	27½	137½
4. A. E. Armstrong, Gobbagumbalin.	208	Federation, Firbank, Zealand.	Cultivated March, 1915, fallowed July and August, harrowed end of August, and cultivated before sowing.	1st week April to 2nd week May.	55 Firbank 70.	46	..	6th crop.	27	18½	18½	16	28	29	137
5. W. F. Stone, "Springwood," Uranquinty.	460	Dart's Imperial, Marshall's No. 3, Federation, Zealand, Red Lammas, and Algerian Oats.	Fallowed August and September, harrowed twice; scarified three times, harrowed prior to drilling.	May	Wheat 56, Oats 45.	45	..	Over 25.	25½	18½	18	17½	28	29	136½
6. A. Alleyn, "Fair View," Downside.	200	Federation, Firbank, Improved Steinwedel, Algerian Oats.	110 acres fallowed June and July, harrowed September, spring-toothed October, scarified February. Balance ploughed February, harrowed, spring-toothed and scarified prior to sowing.	Oats early April, wheat end April to early June.	Federation 45, balance 60.	60	..	8 ac. 2nd crop, 36 ac. 5th crop, 146 ac. 6th crop.	27	19	18	18	27½	26½	136
Maximum Number of Points.. ..									* 1 point for every 1 bushel wheat. 1 ,, 1¼ ,, oats. 1 , 1¼ ,, barley.	† 20	‡ 20	§ 20	‖ 1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops.. 30	¶ 1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops.. 30	

DETAILS OF AWARDS—*continued.*

Name and Address of Competitor.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield.	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total Points.
7. F. Britcher, "Rathmonnt," Malebo.	Ac. 341	Dart's Imperial, Yandilla King, Federation, College Purple, Warden, Firbank, Gluyas Early, Bunyip, Algerian Oats.	170 acres fallowed, harrowed, spring-toothed twice, portion disced, harrowed after drilling. Balance autumn ploughed.	Oats April, wheat April to July.	lb. Oats 40, wheat 45 to 56.	lb. 30 to 50	Pts. 2,250	44 ac. 1st crop, 102 ac. 4th crop; bal. over 30.	* 23	† 19	‡ 19	§ 18½	‖ 27½	¶ 26	133
8. J. Ewart, "Kalimna," The Rock.	523	Federation, Firbank, Avoca, Dart's Imperial.	155 acres fallowed early September, harrowed, disced and harrowed before sowing. Balance autumn ploughed.	May to early June.	45 to 65	35 to 45	..	5th crop.	25	18	18½	19	27	25½	133
9. O. H. Bauer, Milbrulong.	190	Federation, Firbank.	Fallowed end August, harrowed, disced November, spring-toothed prior to drilling.	2nd week May	40 lb. Firbank 80.	40 lb. Firbank 70.	2,340	5th crop.	27	18	18	18	24	27	132
10. P. Bradley, "The Glen," Coolamon.	555	Federation, Marshall's No. 3, Gluyas Early, Algerian Oats.	160 acres fallowed September, harrowed, spring-toothed before harvest and cultivated again before sowing. Balance autumn ploughed.	Oats end March, wheat April 15 to June 4.	Oats 45, wheat 45 to 55. Firbank 80.	30 to 70	1,680	60 ac. 1st crop; bal. old land.	23	17½	18	18	28	26½	131
11. G. L. McNickle, "Kurrajong Park," Wagga.	190	Federation, Bunyip, Firbank.	Autumn ploughed, harrowed, rolled and harrowed after drilling.	End April to Mid-June.	42 to 80	Nil.	2,200	110 ac. 2nd crop; bal 6th crop.	28½	17½	17½	18½	25½	22½	130
12. M. Maloney, "The Grove," Coolamon.	336	Firbank, Zealand, Dart's Imperial, Turvey, Federation.	106 acres fallowed July, harrowed, spring-toothed, disced, portion rolled. Balance stubble ploughed, harrowed twice, portion rolled.	Mid-April to Mid-May.	45 Firbank 75.	45 to 50	..	5 to 20.	23	17½	17½	17	27	27	129

Maximum Number of Points..

*	†	‡	§	‖	¶
1 point for every 1 bushel wheat. 1 " 1½ " oats. 1 " 1¼ " barley.	20	20	20	1st crop .. 24 2nd " .. 25 3rd " .. 26 4th " .. 27 5th " .. 28 6th " .. 29 Over 6 crops.. 30	1st crop .. 24 2nd " .. 25 3rd " .. 26 4th " .. 27 5th " .. 28 6th " .. 29 Over 6 crops.. 30

DETAILS OF AWARDS—*continued.*

Name and Address of Competitor.	Area of Crop.	Varieties.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Rainfall during growing period.	Number of Crops grown previously.	Apparent Yield.	Trueness to Type.	Freedom from defects and disease.	Evenness.	Cleanliness.	Cultivation.	Total Points.
	Ac.				lb.	lb.	Pts.		*	†	‡	§	‖	¶	
13. C. H. Moss, "**Ara Glen,**" **Wallacetown.**	523	**Federation,** Marshall's No. 3, College Purple, **Firbank,** Commonwealth, Schmidt No. 1, Huguenot **Algerian Oats.**	Autumn ploughed, harrowed, rolled.	April to June.	Oats 30, wheat 45 to 50.	45	2,200	110 ac. 6th crop; bal. 5th crop.	25	18½	17	17½	27	24	129
14. P. J. Maloney, "**Kincora,**" "**Coolamon.**"	328	**Federation, Zealand, Firbank,** Warden, **Gluyas Early,** Hard **Federation,** Algerian **Oats.**	132 acres fallowed August and September, harrowed, disced, and cultivated. Balance autumn ploughed, cultivated, harrowed twice.	Mid-April to end May.	45 to 70.	50 to 60	..	10 to 18.	22	18	17	16	28½	27	128½
15. R. A. Laity, "**Woodlands,**" **Marrar.**	428	**Federation,** Yandilla **King,** Firbank. Lammas, Algerian **Oats.**	104 acres fallowed August and September, harrowed October, spring-toothed prior to sowing and harrowed; balance autumn ploughed.	Early May to late June.	Oats 30, wheat 45 to 60.	38 to 42	2,340	104 ac. 1st crop; bal. over 6.	25	18½	17	17½	26	24½	128½
16. O. B. Hoffmann, Milbrulong.	235	**Federation, Firbank.**	90 acres fallowed, cultivated before harvest and prior to sowing; balance autumn ploughed.	May	40 to 50	25	..	25 ac. 1st crop, 90 ac. 3rd crop, 65 ac. 5th crop; bal. 6th crop.	24½	18	17	17½	25	24	126
17. Aylett Bros., "The Grove Garden," Coolamon and Tarcutta road, Wagga.	170	**Zealand,** Federation, Red Straw, Algerian Oats.	Autumn ploughed, harrowed.	Late April to end May.	40	55 ac. unmanured, bal. 40 lb. mixture bonedust and super.	..	15 ac. 2nd crop, 30 ac. 3rd crop; bal. over 20.	24	17½	17½	17½	25	23½	125
Maximum Number of Points									* 1 point for every 1 bushel wheat. 1 ,, 1½ ,, oats. 1 ,, 1¼ ,, barley.	† 20	‡ 20	§ 20	‖ 1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops .. 30	¶ 1st crop .. 24 2nd ,, .. 25 3rd ,, .. 26 4th ,, .. 27 5th ,, .. 28 6th ,, .. 29 Over 6 crops .. 30	

The Sherwood Plots.

The soil on which the experiments were conducted is a deep sandy alluvial which has been growing maize continuously for over fifty years. Moreover, the land is infested with nut grass and has to be kept continually cropped to keep this pest in check.

The experiments were sown on 23rd and 24th September, 1915, and owing to the moisture which had been retained by the thorough previous preparation of the land germination was good. During September, October, and November, no rainfall was recorded, and it was not until the middle of December that the drought was broken with 2 inches of rain. This fall practically saved the crop, as it came just during the flowering period, but in the case of the later variety (Improved Yellow Dent) especially it was not followed by sufficient to fill out the growing cobs. The total rainfall during growth was distributed as follows :—

1915.	Points.	1916.	Points.
September ...	... Nil.	January...	... 115
October ...	... Nil.	February	... 276
November ...	... Nil.	March ...	... 94
December ...	... 305		
		Total ...	... 790

Of the varieties tried, Leaming came out on top with an increase of 5 bushels over the local variety. Acclimatised seed of Hickory King gave an increase of 2 bushels over introduced seed. Of the manures the P5 mixture again proved its superiority, but it was closely followed by the superphosphate and bone-dust mixture.

The following are the yields :—

Variety.	Yield per Acre.
	bus. lb.
Leaming	45 30
Hickory King (local seed)	40 46
,, ,, (introduced seed)	38 41
Improved Yellow Dent	32 11

Manure per Acre.	Variety.	Yield per Acre.
		bus. lb.
1 cwt. superphosphate	Improved Yellow Dent...	37 37
2 ,, ,, ...	,, ,, ...	30 39
No manure	,, ,, ...	32 11
1 cwt. superphosphate, 1 cwt. bone-dust ...	,, ,, ...	42 24
1¼ cwt. P5 mixture (1 cwt. superphosphate and ¼ cwt. sulphate of potash)	,, ,, ...	44 32

Transferring Colonies of Bees from Box Hives to Frames.

R. G. WARRY, Apicultural Expert.

WHEN considering box hives of bees, the bee-keeper must remember that no mean share in the work of producing a surplus of honey, small or large, is taken by his bees; the work of the apiarist is merely accessory to this, following lines which will assist colonies in procuring and constructing what they require in suitable form, at the same time controlling the production of what is not profitable to the bee-keeper, as well as housing colonies so that the detection of disease in its earliest stages is facilitated, and the colonies are best protected from pests. For such work a pattern of hive which permits all the combs and brood, as well as the bees of a colony, to be readily examined, is essential.

Shortly after it was first brought to New South Wales enthusiastic bee-keepers began to copy the pattern of the frame hive, transferring their colonies from box hives, and quickly realising the benefit of the change. Soon the demand upon those who could make frame hives increased to such an extent that it became sufficiently large to tempt manufacturers to make and stock the hive. The extent to which the output of frame hives has grown is well known among bee-keepers, and is often surprising when made known to those who are not particularly interested in apiculture. Now the efficiency of the frame hive, and its use in hundreds of apiaries, are two factors contributing to the thriving condition of the business in bee-keepers' supplies. This, and the fact that the frame hive enables a bee-keeper to carry out practically all the manipulations he finds necessary, and to detect and eradicate foul brood of bees and moths, will be sufficient argument in its favour.

With regard to the box hive, or hive from which comb and brood comb cannot be readily handled, matters are, and must be, for the most part, left to the bees. Under such conditions a colony will operate to suit itself. Very little, if any, inducement can be given it to economise in such a way that the bee-keeper benefits to an appreciable extent, and what is of paramount importance, and has, amongst other things, led to its suppression under the Apiaries Act in New South Wales, is the fact that infectious diseases of the brood of bees cannot be readily detected and treated when they have attacked colonies hived in frameless hives, or in such a way that comb cannot be readily examined. Box hives, as might naturally be expected, are for the most part in the hands of bee-keepers who understand very little of turning an apiary to profitable account and preserving it from year to year; whilst their ignorance of even the elementary signs of diseases of bees, and the slipshod material and methods employed in apiaries of box hives, make them a menace to those who are striving to preserve and increase their stocks and to realise profit through the sale of apiary products.

A box hive, as the name implies, is merely a box, a kerosene case or butter-box in the majority of instances, in which a swarm of bees has been hived. Since the use of any hive from which the bee combs cannot be separately and readily removed for examination is forbidden (Apiaries Act, 1916), an account here of even the best of systems for working box hives would be superfluous; the same may be said of a comparison of frame and box hives in detail.

Transferring.

Two good methods are in general use for transferring colonies from box hives to frame hives. Bee-keepers modify these to suit their own convenience in a variety of ways.

One, which is quicker, though more troublesome, than the other, consists of first driving bees and queen off their brood and honeycomb, returning them their combs after the latter have been fixed in frames.

For this, choose a warm day, preferably in late spring or summer, when nectar is being freely gathered, and do the work some time between about 9 a.m. and 4 p.m., when the bulk of the flying bees will be out of the hive. Transferring will be successful if done during an autumn flow of honey, but it is better to do it during spring or summer, as the comb building the colony must undertake after it has been transferred may be considerable, and spring and summer are on the whole the best seasons for comb building.

Whatever may be required for the work should be in readiness before making a start—a reel of bee wire, some pieces of string about 2 feet long, tack hammer and fine nails, an uncapping knife or large table knife for cutting out and slicing pieces of comb, a hive tool and smoker. The comb from the box hive has to be exposed for some time whilst being fixed in empty frames. Provided there is a good flow of honey at the time the work is being done, no trouble will be met with from robber bees raiding the honey cells in the exposed comb; still it is generally advisable, and always more convenient, to deal with the comb in a room or shed where bees cannot find it; protection from robber bees is imperative if transferring has to be done at a time when the flow of honey has ceased.

Smoke the box hive and move it a little to one side or back of its stand, and place a frame hive containing a few empty wired frames on the spot just occupied by the box hive; this is to accommodate returning field bees which were away from the box hive at the time it was shifted. If no spare frame hive is available, a clean empty box will serve, as it is only to remain temporarily. Make sure that the smoker is well alight, and has plenty of fuel to keep it going for some time; it will be needed several times before the work is done. Avoid a thin, blue, hot smoke. The smoker should be burning so that it gives a dense cloud of cool smoke; with this there is no risk of singeing bees. Hot smoke, or the scalding steam from a little damp fuel put in a fiercely burning smoker, can do a lot of harm.

The box hive should then be rather heavily smoked, and turned upside down. In this position, with a piece of its floor removed, an empty box with sides and a bottom, but no top, is fitted bottom upwards over the box hive. A puff or two more of smoke is then blown into the box hive through any convenient chink or crack, and its sides " drummed," or rapidly beaten with a couple of short sticks. After five minutes or so of drumming and a little more smoke, the top box can be gently tilted, and the bees will be seen leaving their comb and brood in the old hive and streaming away from the vibration of the drumming into the top box. Drumming, with an occasional puff of smoke to hasten the bees, should be continued until the combs of the box hive are practically clear of bees. The time that the drumming must be continued to get the bees out of the box hive varies with one colony and another. Directly the drumming is finished, turn the box over gently, cover it with a box, and place it in the shade until it is required again.

The box hive, without its bees, is then taken to where preparations have been made for dealing with its comb. Here a table and several empty unwired frames should be ready. By opening the box hive at one side, the box standing upside down, the comb in it can be reached and removed a piece at a time (comb will not be fastened to the bottom of the hive). Every colony of bees constructs a brood nest of an area of comb varying according to its strength, storing honey and pollen in comb over and on both sides of its brood nest. The first pieces of comb met with after removing one side of the box hive will generally be more or less irregular sheets of drone comb either empty or containing honey, next come the combs of the brood nest, each containing some stores of honey and pollen and an oval patch of brood, and on the far side honeycomb again. This mass of comb is often very irregularly built so far as its contour is concerned; pieces will be found running fairly straight, and then branch in two directions, and the whole is strengthened by bridge comb and brace comb in several places, as well as being attached all round to the sides of the box. Some patience must be exercised and the comb cut out so as to get the largest and flattest pieces. Put the honeycomb and empty drone comb aside and select first of all the best pieces containing brood and eggs for fitting into wooden frames.

Four or five lengths of bee wire or string, each about 24 inches long, should be laid on the table about 3 inches apart. An empty frame is then laid over a good piece of comb and the latter trimmed so as to get the best of it fitting into the frame. The frame of comb is then placed on the pieces of wire or string which must be tied round the frame across the top and bottom bars; this prevents the comb slipping out when the frame is hung vertically in a hive. Turn the comb with the honey to the bottom of the frame.

Proceed in this way until all the best pieces of comb containing worker brood, the best pieces of honeycomb, and whatever there may be of straight empty worker comb have been transferred. Reject as much drone comb as possible, as well as any very crooked pieces of brood or honey comb. A few slabs of comb from the box hive will be obtained large enough to fill a frame, but most of the frames will have to be filled by several pieces of comb cut to fit as best they may. As each frame is completed it is hung in a frame hive with the spacers on the frames touching each other, and when all the comb worth transferring has been fixed the whole is put out on the stand which the box hive occupied; a bag or sheet of newspaper is spread at the entrance, and the box of drummed or driven bees emptied on to the bag. To do this, stand facing the hive and hold the box of bees by the sides about as high as the knees, send it fairly quickly forward, stopping the movement suddenly with the mouth of the box towards the hive entrance. This will jerk the swarm out on to the alighting board and bag. So soon as a few bees find the brood in the frames the fanning and characteristic odour passed by the fanning to the bees farthest from the brood will be noticed, and the swarm will crowd into the hive and cover the combs of brood, the queen going with them. Some bee-keepers do not throw the driven bees out of the box as described; they simply rest one corner of the box on the alighting board of the hive, and to start the bees moving, shake a handful of them right at the entrance, and these soon find their brood and signal the rest by fanning. Either way will answer; the former is perhaps more interesting to watch.

The transferred colony should now be left undisturbed for a day or two, when it can be examined and its frames made up to the full number required by adding wired frames, each provided with a sheet of foundation.

During this time the bees will attach the transferred comb to the frames, join pieces together, fill most of the spaces which could not be filled when transferring, and generally "clean house." With care and a good honey flow a very good job can be made of transferring a strong box hive of bees and good straight comb result. Owing to their shallow depth, transferring is made easier when using Bolton or 5⅝-inch frames.

A Second Method of Transferring.

The second method takes longer than what has been described, but is less troublesome.

A brood chamber provided with wired frames and sheets of foundation and, if available, a drawn comb or two, and a comb of unsealed brood and eggs is fitted over the inverted box hive, a strip of the floor board of the latter having been previously taken out. The box hive is smoked and drummed as in the method already described, thus obtaining bees and queen on the frames above it.

The drumming complete, the frame hive is lifted and a queen excluder or honey board fitted between the two hives and the whole allowed to remain in this condition for three weeks. By this arrangement, the queen is trapped in the top hive, only worker bees having access to the brood next below the excluder. The comb of unsealed brood in the top hive will attract young bees there, and the honey in the inverted box hive being now under the brood instead of over the brood where the bees would naturally place it, will be moved into the comb above the excluder, the "traffic" in honey stimulating the queen to lay, thus making the beginning of a brood chamber where it is wanted.

At the end of three weeks all the worker brood in the box hive will have emerged (a worker bee emerges from its cell in twenty-one days after the egg was laid; drone brood can be disregarded), and since the queen cannot replenish the vacant brood cells in the box hive because of the excluder, the brood nest is of necessity transferred to the frame hive. When the box hive is abandoned its comb can be melted down and passed through a press.

Much of the ease with which comb can be handled depends on the way foundation is fixed in frames. Where this has been badly done or insufficient foundation used, the result is seen in a mass of comb more or less like that in a box hive. The Apiaries Act requires such comb to be readjusted so that they can be handled and examined separately. Often when a frame hive is in this condition one or two combs will be fairly straight and built in their frames so that they can be got out without breaking, and after a little "coaxing" the rest can be turned and made to occupy the frames. But some frame hives are in such a condition that for examination purposes they are worse than box hives, the comb being built diagonally across the hive, and the frames an additional impediment.

When this has happened, the bees can be drummed from the hive as from a box hive, then, with the hive inverted, and by cutting close to the inside of it, the latter can be lifted clear of the comb and frames which must then be dealt with in the same way as the comb in a box hive.

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

The Sow Thistle (*Sonchus oleraceus* L.)

(COMPOSITÆ : Thistle or Daisy Family.)

Popular description.—An annual with a yellow flower like a dandelion, with a tap-root and an erect, branched stem, with toothed clasping leaves. It has a hollow stem and milky juice.

Botanical description.—An erect, glabrous annual with hollow stem. Leaves alternate, sometimes prickly toothed, the upper ones stem-clasping and undivided, the lower ones usually pinnatifid. Flower-heads in a short corymbose terminal panicle. Florets yellow, all ligulate. Achenes not beaked, with a pappus and numerous fine simple bristles.

Names.—The name "Sow Thistle" is a very old English one. I do not know that sows are especially identified with it, although pigs, in common with all grazing animals, eat it greedily. It is not a thistle in the modern sense of the term ; a century or two back the word had a very extended meaning and was applied to almost any plant that, after flowering, produced "thistle-down."

In Sydney, where the old name has no special significance, it is most commonly known as "cocky weed," as it is so frequently gathered for cockatoos.

Two forms.—There is a more rigid form, with prickly toothed leaves which also occurs in New South Wales and possesses the same properties. It is known as variety *asper* (rough), and some, following Linnæus, look upon it as a distinct species, under the name of *Sonchus asper*, but there are gradations between it and the normal form.

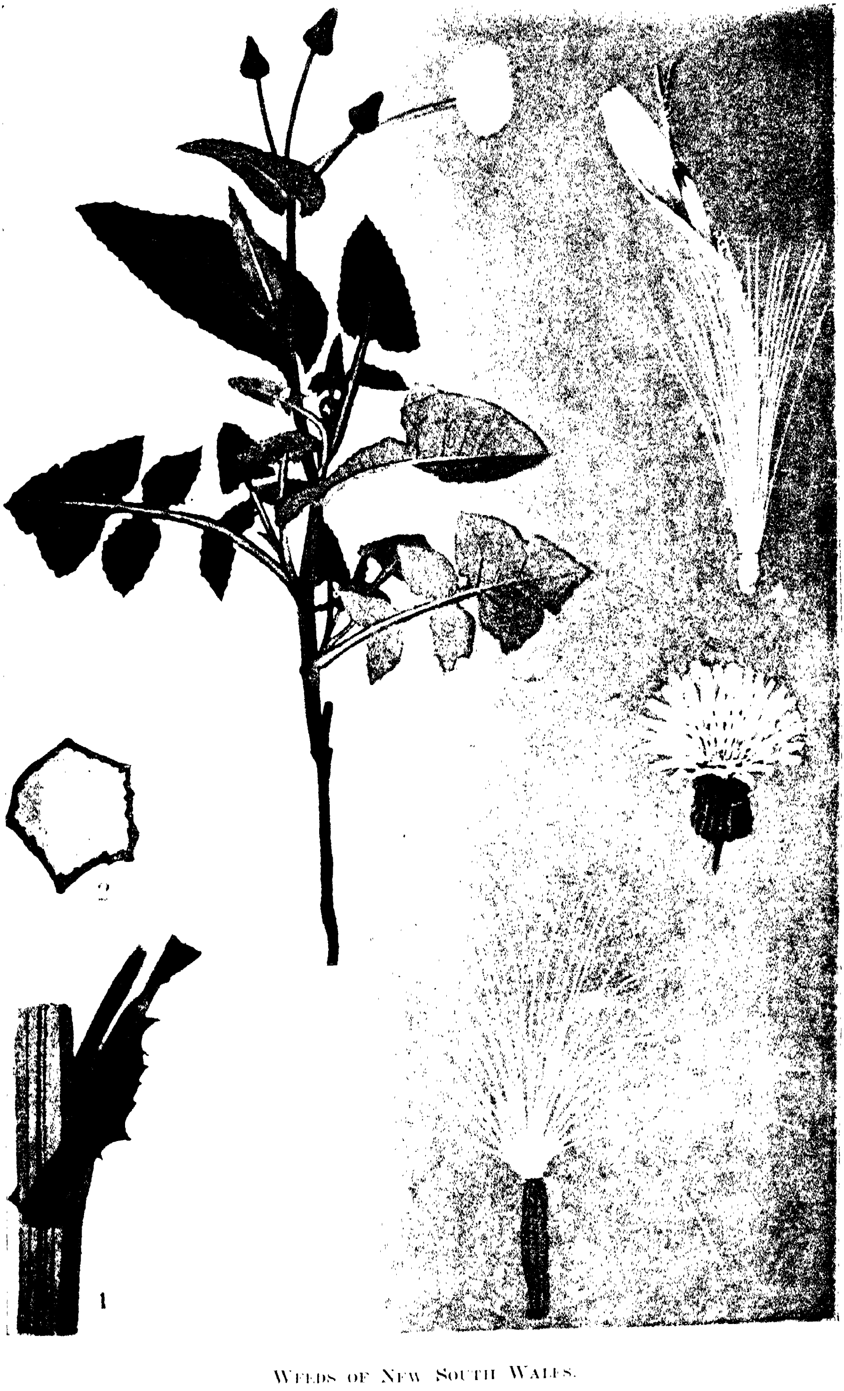
If you turn to the plate, figure 5 (it is magnified a dozen times) shows the seed of the normal form like a minute maize-cob, the individual "grains" corresponding to minute transverse roughnesses. In variety *asper* the seeds are quite free from these roughnesses.

In other words, the ordinary Sow Thistle, which is quite a smooth plant, has rough "seeds" or achenes, while the variety *asper*, rough or prickly as its name denotes, has smooth seeds.

EXPLANATION OF PLATE.

Plant reduced to one-third natural size.

1. Portion of stem showing the clasping base of the leaf.
2. Section of stem showing hollow centre.
3. Flower. Natural size.
4. Ligulate floret (x 12).
5. Seed with pappus (x 12).



WEEDS OF NEW SOUTH WALES.

"SOW THISTLE."

Sonchus oleraceus, L.

Its economic value.—This is a plant known to everyone who keeps birds. The singing birds at once eat the underneath portion of the flower, particularly if it is going to seed, and so does the tame cockatoo, while a handful thrown to the fowls is at once devoured, and no growing plant of it is ever seen in the fowl-yard.

There is little fibre in it, and, so far as I am aware, there is no deleterious property of any kind in this weed.

Leichhardt, in his "Overland Journey to Port Essington," says that the young shoots make an excellent vegetable, and on more than one occasion I have known it to be boiled and used for food when vegetables are scarce. It is, however, only a stop-gap, and certainly not a rival of spinach and cabbage.

An Alien.—Bentham speaks of it as "a weed of cultivation, probably indigenous to Europe and temperate Asia, but now distributed over the greater part of the globe, and perhaps truly indigenous in Australia."

It is now found in many districts in all the States.

It occurs near the water's edge in most countries, and sometimes is found in places where there is scarcely an introduced plant competing with the native vegetation. Hence the difficulty, in any particular country, of saying that it is an alien. In Australia it has spread, during historic times, in many localities in which it is now abundant, but, so far as we know, it existed in Australia before the advent of the white man. Hence some botanists look upon it as indigenous, but, bearing in mind its facility of migration (its seeds can be blown across the water for great distances), its colonising power, and the fact that it is not specially Australian in its relationships, it is better, I think, to look upon it as introduced.

How to get rid of it.—It is a weed of cultivation; it becomes a "nuisance"; it interferes with the orderly appearance of the tidy garden, and hence it chiefly offends the æsthetic sense. It contains no trace of poison.

Wherever ground is broken up, or there is a holding place for ever so little soil the Sow Thistle may establish itself. It is an annual, and the only way to get rid of it is to pull it up before it matures its seeds It is, however, very difficult to control; I have known an area apparently completely free from it one year, sown thick with it the next, the seed having come we know not whence, carried by the wind, helped by the thistle-down.

It is only in a garden that one desires to get rid of it, and I recommend no method other than hand-pulling.

The Cat's Ear or Flat-weed (*Hypochæris radicata* L.).

(COMPOSITÆ: Thistle or Daisy Family.)

Popular description.—A dandelion-like plant from which, however, it can readily be distinguished by its less deeply toothed and more hairy leaves, and its branching flower-stalks.

Botanical description.—A hispid perennial, leaves all radical, spreading, toothed or pinnatifid. Stems erect, branched, with large terminal flower-heads. Florets yellow, all ligulate, much longer than the involucre. All achenes with slender beaks; the pappus plumose.

Names.—In Australia this is generally known as "Flat-weed." because its leaves, like a rosette, lie flat on the ground. It is also known, to a not inconsiderable extent, as "Dandelion"; this in ignorance, as it bears some superficial resemblance to the true Dandelion (*Taraxacum Dens-leonis*).

In Smith and Sowerby's classical "English Botany" the name is given of "Long-rooted Cat's Ear," in contradistinction to other species of *Hypochæris*, which are known as Cat's Ear.

Objectionable features.—Like so many of our weeds, this comes from Europe, Northern Africa, and Western Asia. It has now spread in every Australian State, chiefly in grass paddocks. It is one of those plants with which we are so familiar and which has no outstanding characteristics, that little has been written about it.

The chief objection that is raised to it is that its rosette of leaves smothers good grasses, and, as stock are not attracted by it, it often forms large patches to the exclusion of most other vegetation. On a lawn it is a positive disfigurement, especially as the long flower-stalks add to its unsightliness. It possesses no poisonous properties, and can only be got rid of by means of the hoe, or some other cutting implement, which is of course only practicable where the cost of labour is relatively unimportant, as in the case of a tennis-lawn. It is of advantage to cut down the flowers by means of a scythe or lawn-mower according to circumstances, but, like the Sow Thistle, it is a matter of luck to what extent one's land may be re-seeded by it in any particular year.

EXPLANATION OF PLATE.

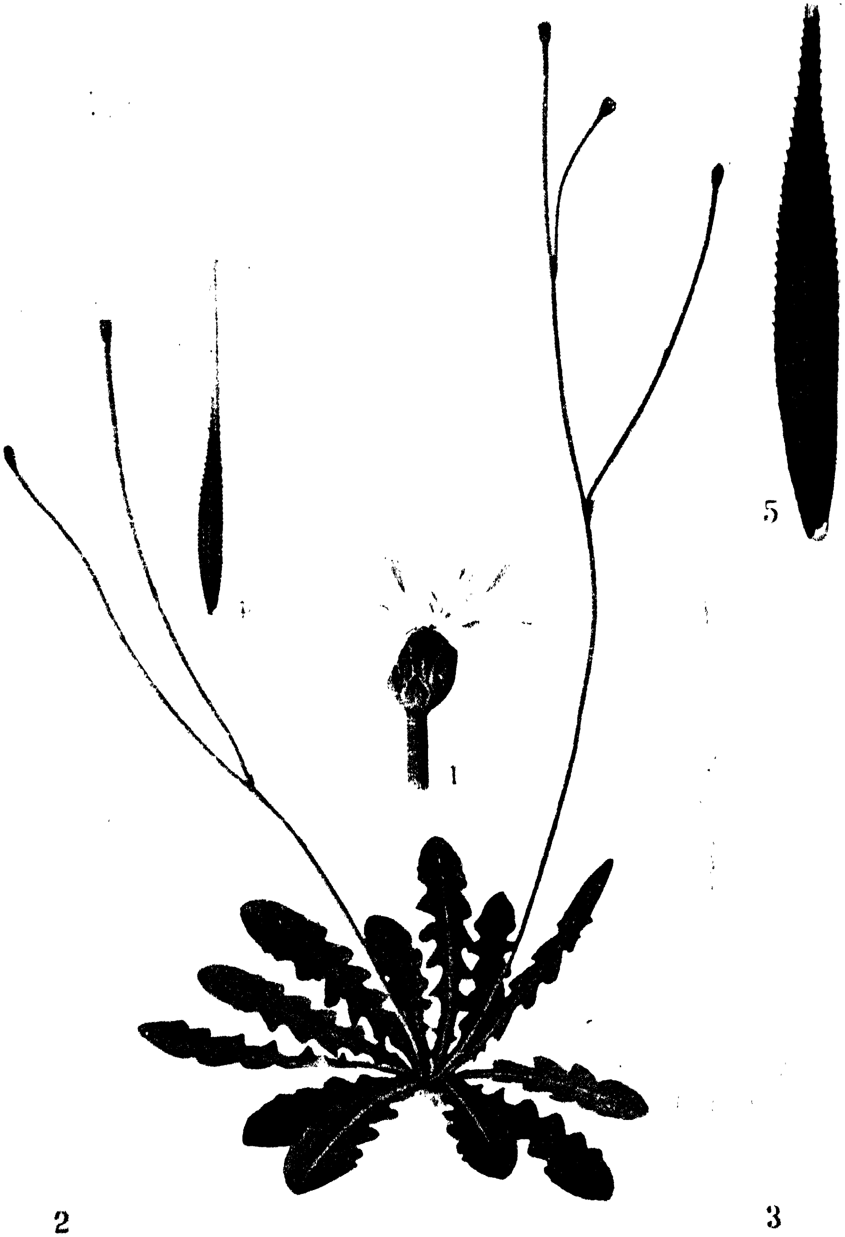
Plant reduced to one-third natural size.

1. Flower natural size.
2. Ligulate floret (x 20).
3. Floret opened to disclose anthers.
4. Seed showing beak and pappus.
5. Seed greatly magnified to show sculpture.

I regret the necessity for reducing the size of the plant as it is likely to cause confusion with another species, but any erroneous idea will, as far as the flower is concerned, be corrected by examination of figure 1.

A POISON BUTTERCUP (*Ranunculus sceleratus* L.).

IN the December *Gazette*, page 865, I make the statement that this plant has only been recorded in New South Wales in 1913. This appears to be true, but Mr. C. T. Musson, F.L.S., of the Hawkesbury Agricultural College, says that I named a plant for him in November, 1907, which had been collected at Baker's Lagoon, near Richmond, New South Wales. This specimen was not preserved in the National Herbarium, and hence the record was lost sight of. I hope that farmers and others will look for this buttercup which is, I fear, widely distributed in this State.—J. H. MAIDEN.



Weeds of New South Wales.

"CAT'S EAR OR FLAT-WEED."

Hypochæris radicata, L.

The New South Wales Dairy Industry.

POINTERS FOR DAIRY FARMERS.

M. A. O'CALLAGHAN.

1. The future of the New South Wales dairying industry, and probably of that of Australia, depends on the oversea export of butter.

2. The future of this *export trade* depends on the quality of butter produced in our factories.

3. The *quality* of *butter* produced in New South Wales factories will depend mainly on the quality of the cream delivered by farmers to such factories.

At this stage when the immediate future has a rosy prospect it may seem inopportune to write anything of a pessimistic nature, but there is no getting away from the fact that though the war has brought Australian dairy farmers a most excellent price for oversea dairy products, nevertheless the war has placed margarine on a pinnacle which it would not probably have reached for twenty years to come but for the war. Now margarine manufacture is quite a valuable industry, and one in which British interests are involved to a considerable extent, for the simple reason that a number of British colonies are suitable for the growth of cocoanuts, which now enter so largely into the manufacture of margarine. Margarine advocates claim that Great Britain saved £20,000,000 by the use of margarine last year. This figure is obtained by comparing the value of all the margarine imported with what the cost would have been had it been all butter. The way I look at it is this: only for margarine the British public largely would have had to go without a fatty substance to place on their bread to represent butter, simply because there was nothing like sufficient butter available for consumption. This was due to the cutting off of all Russia's butter supply, as well as to the reduction in the amount of butter supplied by Denmark, Sweden, Holland, and France. Margarine manufacture not only increased in England to an enormous extent, but the import of margarine into England for the eight months ending 31st August, 1916, exceeded the import of butter by 265,485 cwt. Most of this margarine came from Holland. The import of margarine for the eight months mentioned amounted to 1,718,330 cwt.; had this been at butter value it would have been worth about £15,000,000. These facts give effect to a great deal of reflection, and the people most concerned are our dairy farmers. Many people in Australia have the idea that margarine is an unpalatable and nauseous food. This opinion has come about as the result of the fact that only a very poor standard of margarine from a butter point of view has been manufactured in Australia up to the present. This is due to the fact that margarine manufacturers here aimed solely at supplying the demand from pastrycooks; but owing to the shortage of butter last year a good attempt was made to improve the quality of margarine, and a very considerable quantity was sold for table purposes. The quality was, and is still, very inferior to butter, as compared with the best quality margarine produced in England and Europe. The fact that the people in England are at the present time largely depending on margarine "for their butter supply" should be sufficient to convince our farmers that the substance as made in Europe is a satisfactory substitute for butter.

Margarine, even of the best quality, however, is not as valuable a food as good butter, nor is it so palatable as choicest butter, and it is on these two points, mainly the latter, that the future of the butter industry rests. In a paper read in 1914 at the Factory Managers' Conference, I made the following statement:—

"There seems to be an idea that, provided a food can be obtained showing the percentage of fat equal to the amount of butter-fat in butter, that the food should be as nutritious as butter. An inquiry into the subject must throw grave doubts as to the truth of the statement that animal-body fats or vegetable fats are equal in nutrition to butter-fat. In the first place, there is no other fat known to man which has the same chemical composition as butter-fat. Butter-fat contains a higher percentage of volatile oils than any other animal fat, or vegetable fat, and it also differs from all other fats in so far as it contains about 7 per cent. of butyrin—a glycerine peculiar to butter-fat.

"In support of the statement that the quality of the article is affected by the percentage of volatile fatty acids, Violette's analysis shows that butters of superior quality contain more butyrin than butters of inferior quality, though 5 per cent. butyrin was the lowest which his analysis showed.

"What then will we say of the quality of a substitute which contains no butyrin, and is also deficient in the glycerides of other volatile fatty acids?

"Now if Nature made this selection, and if it is also shown that butter-fat stands alone in its chemical composition, surely we ought to accept the teaching that milk-fat, for the young at least, is more suitable and more nutritious than is any other fat. If we admit that it is more suitable for the immature organism, we must also admit that it is more nutritious and more suitable for all that are not in vigorous health."

This viewpoint is being borne out by experience, but when all is said and done this aspect of the question affects only a very small percentage of the population of a country. If butter is to be used only for the young and the sick, then very little butter indeed, comparatively speaking, would be required. Butter makers will have to depend for the success of their product very largely on its palatability, and on the general claim that it is more easily digested than margarine. These two points count very largely with those people who can afford luxuries, and what I want to impress on the minds of our farmers in relation to this fact is that *inferior butter* cannot, and certainly will not, be looked upon by such people as a luxury. All butter is more or less a luxury in some countries at the present time owing to the war, but this disastrous war cannot last very much longer, and after peace has been restored it is expected that there will be a bad condition of things economically; consequently the spending power of the people of England, who are our great consumers of butter, will be considerably reduced, so that those countries producing butter for export to England will have to fight very keenly for position on this market, and *the fight will be on the question of quality.* Nothing else, it is anticipated, will count very much, for the simple reason that no matter how cheaply inferior butter is sold, it cannot be produced to be sold at anything like the price of good margarine. Each farmer and each factory manager should now ask himself the question: Are we fully prepared for the fight that is to come; if not, what can we do to place ourselves in a better position to carry on this economic fight?

The people of Denmark have acted very shrewdly in the management of their export butter business during this war, for, despite the fact that higher prices were obtainable in Germany, they have continued to supply England with a very large proportion of their production. In fact, more than half of the butter imported into England for the first eight months of the current year came from Denmark. Sweden, on the other hand, has almost ceased to supply butter to England. The Danes know that England has been their chief market for many years, and they know that after the war they will require England's market, and consequently they are not prepared to risk losing their position on it for the sake of a temporary gain. How do *we* stand as compared with Denmark and Ireland the only part of the British Isles which supplies butter largely to England? To begin with, both Danish and Irish butters are sold retail under the name of Danish and Irish butters, whereas Australian butters are rarely sold retail as Australian butter. This fact should be sufficient to show where we stand. If the quality of our butter was considered by the British public to be equal to that of Danish or Irish, our butters would be sold under the name of Australian, and we would then obtain the full price to which the quality of our butter is entitled, and those factories making a product of the very highest class would then obtain their full value therefor. Australian butters, however, are so largely sold for *blending purposes* that at the present time it does not matter about their identity, and it is customary to sell butters of varying qualities in a line at one common average price. In this way those who have marketed a high quality product have sometimes suffered individually, but they have benefited their fellow-Australians by getting better value for the lower qualities.

Value of Pasteurisation.

It should be stated clearly that we cannot expect to put on the British market, after the long voyage from Australia, as palatable a butter as can be put on by Danish and Irish merchants, for the simple reason that fresh butter has a flavour which is not present in a butter which has been held for six or eight weeks. Very few consumers, however, are such keen judges that the freshness of flavour referred to counts as a vital factor. The Danes, realising the necessity for preserving the flavour of their butter until it was consumed by the English people, many years ago adopted the system of pasteurisation in all their butter factories. Now pasteurisation does not improve the flavour produced from butter made from the choicest cream, but it has the effect of preserving a good flavour in the butter for some weeks after manufacture, provided always that the butter was made from cream of good flavour originally.

Please bear in mind that, no matter what you hear to the contrary, the process of pasteurisation does not *produce* the *flavour* of butter; that flavour is produced by the *butter-fat* itself, and any ill flavours present are due to defects which can be overcome by the farmer by taking sufficient care. Pasteurisation is merely a process of cooking, which destroys germs that cause organic matter to decompose rapidly. A thrifty housewife takes care that during the hot weather she will cook the joint of meat before it has time to become tainted, though she may not be able to consume that meat for a day or two. The cooking process is done at the early stage so as to prolong the life of the meat as an untainted product. Pasteurisation of cream is done for the same purpose. It will therefore be evident to the farmer that if he supplies a tainted cream to the factory the manager can no more make that a choicest cream by cooking or pasteurising than the housewife can by cooking a joint of meat that had previously become tainted. If the taint is only very slight, the cooking process in each case will prevent further development, and consequently bring about an improvement.

Recently there was an idea prevailing that by pasteurisation of cream a good butter could be made from an inferior raw product. Experience is showing, however, that those who had such ideas were labouring under a mistake. Consequently the responsibility for the flavour of our butter still rests on the shoulders of our dairy farmers, and if they do their work the improved appliances and methods now used in factories will enable a butter to be produced which will hold its own on British and other oversea markets.

The Dairy Industry Act in Relation to Quality.

Being aware of the seriousness of the position the New South Wales Government, on the 21st December, 1915, passed an Act known as the Dairy Industry Act. This was brought into force solely with a view of placing the industry on a better and sounder footing than it had previously occupied. The quality of a large percentage of the butter was not, generally speaking, of a standard which was calculated to hold its own, and maintain a price which *would pay the producer,* in the face of the improving margarine competition. Consequently the Government set about to prepare for the fight which must come, and it will be a question of the survival of the fittest. The facts go to show that the consumer at least will only require butter of a higher quality than margarine. If inferior butters continue to be produced, no doubt they will be deodorised and used in the manufacture of margarine. It is only by preparing in time that we can hope to be ready to hold our own against those that have been manufacturing choicest butter for years. The present war is the greatest illustration the world has ever had as to the value of preparedness, and as to the terrific disadvantage of unpreparedness. Those dairy farmers who are not prepared, and who are not preparing for the delivery of cream of choicest quality will find that their *place will have gone,* and that they will not be wanted in this industry.

It is satisfactory to be able to state at this stage that since the inception of the Dairy Industry Act a great improvement has taken place in the quality of cream delivered at butter factories, and a still greater improvement has taken place in the quality of butter placed before the public.

A table was given in last month's issue which showed that for the three months ended 30th September, the quality of butter manufactured in New South Wales' factories showed about 75 per cent. to be high-class. This is extremely satisfactory, as it is a considerable improvement on anything that we have had on previous years for the same period

Four factors are accountable for this important condition of things:—

(1) Many farmers, knowing that all cream had to be graded under the Dairy Industry Act and that they would be paid according to the grade, took more care of their cream than formerly.

(2) The grading of cream at butter factories has been done more strictly and more according to a definite standard than hitherto.

(3) The weather conditions prevailing were rather better than usual for the period of the year referred to.

(4) A very large percentage of butter factories in New South Wales have put in improved machinery in the shape of pasteurising and cooling plants during the last twelve months.

In reference to the latter, I desire to acknowledge the assistance which the Dairy Branch has received from the principal co-operative companies, and from other butter merchants, in endeavouring to persuade factory managers and directors to install pasteurising plants in the various factories. The directors of butter factories are to be congratulated also in having risen to the occasion, even though pasteurising machinery is now very much dearer than before the war.

When we look upon these factors that went towards the improvement in butter referred to, we should be able to rely on all of them but one, namely, the weather conditions; and, after all, the *effects* of weather conditions can in most cases be controlled by the farmer. Improved transit is a great aid in forestalling any possible ill effects of bad weather conditions, and with the improvement that is daily taking place in transit arrangements it should be possible to deliver daily during the summer months, quite 70 per cent. of the cream produced. If this is done, the farmer's labour as regards governing the quality of the cream will be greatly minimised, and the factory manager with his pasteurising and refrigerating machinery will be able to do the rest.

We will now proceed to discuss the most serious problems in connection with the production of cream of the very highest quality.

To begin with there are a few things in connection with the Dairy Industry Act which dairy farmers should thoroughly understand. The first is that all cream supplied to the butter factory *must be graded,* and paid for *according to grade.* The second is that the butter factory must *credit the farmer with every ounce of butter made from his cream,* or in other words the overrun which hitherto was, generally speaking, retained by the factory, is now to go to the individual farmer, not in the shape of an increased price, or in any other shape whatever, but as butter. Some factories have protested against this part of the Act, as they state that it was necessary to retain some overrun in order that the factory might be in a position to buy new machinery, &c., when required. There is nothing in the Act, however, which will prevent shareholders, or the suppliers, authorising the factory to deduct from their account each month a certain given sum to be retained for such purposes as those mentioned. It is therefore seen that the man who forwards high-class cream to the factory must be paid for it as such, and that he no longer has to support or bolster up the supplier of inferior cream.

In the past, no doubt, the overrun was utilised to some extent by some butter factories for the purpose of paying a price for inferior cream which was not warranted, and which could not be maintained if there were not supplies of high-class cream to the factory. The farmer, on the other hand, must bear in mind that there is no option for the factory manager but to put his cream into the second grade, if the quality is of this character, and instead of blaming the manager of the factory for so doing, he should thank him; as this action enables the farmer very often to find out what may later on become a serious trouble if not checked at an early stage. Frequently inferior cream is due to defects which cause other injuries than that of inferior cream; it is sometimes due to illness of cattle, to bad water, to uncleanliness in the neighbourhood of the bails, &c. Any of these things, if occurring without the knowledge of the farmer, are certainly prejudicial to his interests, apart from the question of the quality of the cream, as they may possibly lead to disease entering further into his dairy herd or affecting his calves, or worse still, may lead to illness amongst the members of his own family.

Some few cases have been brought under my notice recently whereby farmers have changed from one factory to another simply because they were given second grade by their local factory. There is no wisdom in this step. The manager of the other factory is compelled to do his duty equally with the one which the farmer has left, but unfortunately, for the equality of things, the farmer before transferring his custom to the new factory generally has a good cleaning up in his dairy premises, and takes special care to favourably impress the manager or cream grader at the factory where he proposes to transfer his custom.

The District Dairy Instructor, who acts as inspector under the Dairy Industry Act, has been advised to inquire during every visit to a butter factory as to what new suppliers have come, and the creams of such suppliers are very carefully inspected, especially if it is found that they have come some distance, and have passed by local factories. All other things being equal, the nearer the butter factory is to the farmer the better the quality of the butter, which should be made from the cream, and it is against the best interests of the industry for farmers to send cream a long distance by railway simply because they have been penalised for inferior cream by the manager of the local factory.

How to Avoid Having Cream of Inferior Quality.

Let me say right here, and in the plainest language, that three-quarters of the inferior cream received at a butter factory is due to a want of cleanliness in some part of the dairy operations on the farmer's premises. During the last two years, in the process of examining cream graders throughout the State, I have had opportunities of sampling the creams supplied to a large number of our dairy factories. In addition to this I receive weekly reports from the various district dairy instructors as regards the quality of the cream supplied to the butter factories, and I can unhesitatingly say after making hundreds of physical and bacteriological examinations of such creams that the inferiority has been brought about by the action of microbes that should not be present in cream if strict cleanliness was observed.

Cleanliness in Milking.

Milking with dirty hands that have been soiled by the unclean udder of the cow, and dipping those hands into the milk so as to moisten the cow's teats, and thus reduce the friction in milking, is probably the main cause of a large percentage of inferior cream. Cow manure contains myriads of microbes whose duty it is to decompose such waste products, and the soiled hands of the dirty milker introduces these germs into the milk. Hence these germs of decomposition simply rot the cream and butter. Every cow bail should have a washing basin and a towel placed therein, so that the milker can wash his hands without trouble or delay. In addition to this, a little vaseline, or better still, a pot of vaseline to which a little boric acid has been added, would be a very valuable asset in the dairy. A little of this put on the hands prevents friction in milking, and also prevents sore teats. Many a cow is partly dried off through sore teats, and this is a distinct economic loss to the dairy farmer.

Unclean Separators.

The second greatest cause of inferior cream is undoubtedly a badly cleaned separator. In this warm climate, during the summer, it is necessary to separate the milk twice a day, and frequently it is late in the evening when milking and separating are finished; consequently the inclination towards being satisfied with passing a little warm water through the separator after separating is a tempting one, especially if the work of looking after the dairy is in the hands of people who do not suffer directly through inferior cream being produced. Next morning that separator, after a warm night, is no cleaner than the partly washed intestine of a cow after butchering. Every farmer knows that the centrifugal separator is a great cleanser, and all dirt and particles of broken-down cells are thrown on the outside of the separator machine during the process of separating the milk. Now this matter which adheres to the sides of the separator is first-class food for putrefactive microbes, and consequently in a few hours this slime becomes the home of millions of enemies to the dairy farmer. To put the next morning's milk through without thoroughly cleansing such a separator will mean that though the cream may not taste or smell badly for a couple of hours after it has been separated, it will undoubtedly give forth bad odours and a bad taste within twelve or fifteen hours. Even when such cream is pasteurised *all* the dirty germs are not destroyed,—the seeds of many of them remain alive to cause trouble in the butter at a later stage. If a man is trying to milk so many cows that he has no time to look after the separator properly, he should reduce the number of cows in milk, and pay proper attention to the separator. It should not take more than twenty minutes to properly cleanse the separator at night. Supposing a man has a herd of cows which gives him 50 lb. of butter per day, and that the cream proves of inferior quality, he will lose say, 1d. per lb. or 4s. 2d. per day. This means the earnings of at least four cows, and probably the gross profit of eight cows, so that it would pay the farmer to milk eight cows less, save labour, and attend to the separator more thoroughly.

The Unclean Milking Machine.

With a scarcity of labour of a suitable character there is a likelihood of the milking machine being used to a greater extent than formerly. Let it be stated clearly that the greatest defect in connection with machine-milking is not due to the machine, but to the man who looks after it. There is not a factory manager in the State who is not against the use of milking machines wherever labour can be obtained to do the milking without the machine. This is due solely to the fact that the cream obtained from the farmers using machines is generally speaking of a tainted character, and will not produce butter of the choicest quality. When the rubber tube of a milking machine once becomes tainted, by allowing the tube to go without being properly cleaned for a day or two, it is impossible to get untainted cream from the milk which passes through the rubber tubes again. If the rubber tubes are allowed to go without being thoroughly washed, the particles of milk remaining behind are absorbed by the rubber and the milk decays in the pores. A peculiar taint is then imparted to the rubber, and all milk passing over it is given this taint, despite the fact that the farmer may thoroughly cleanse the tubes repeatedly, after they once become foul. There is no gainsaying the fact that it is difficult to keep the rubber tubes of the machines in a satisfactory condition. Limewater is satisfactory for keeping the actual tubes therein, but it is not satisfactory for the teat cups, because the metal of almost all of these cups becomes injuriously affected by the action of the lime. I have found that the addition to water of a little of what was previously known as formalin, and which may now be purchased under the name of formaldehyde, is effective in keeping the rubber fairly sweet. For preference, the water should be boiled, and such water may be utilised for three or four days provided the rubber is washed and cleansed before being placed into the bath where it remains between milkings.

All that has been stated about the unclean separator may be repeated about the unclean milking machine, and 100 per cent. added to it, for the separator is cleaned at least once a day, and the sunlight helps to sterilise it if the farmer has a suitable place to put the parts of the separator. On the other hand, no sun can reach the inside of the tubes of a milking machine.

Treatment of Cream in the Dairy.

We have now reached the stage when we will expect a clean cream to be delivered from a clean separator into a clean receptacle. Many farmers use small cream cans and run the cream direct from the separator into the cans, others use special cream buckets. There is really no advantage in the bucket over the can, provided that the latter has been thoroughly sterilised before being used, and thus arises a very important question, namely, how many cream cans are *thoroughly cleaned* before being used? In some cream factories the cans are thoroughly cleaned before being returned to the farmer after each day's cream supply. In other factories no attempt is made to cleanse the cans thoroughly; they are simply washed in warm water after the cream has been removed from them. Now butter fat, when it becomes exposed to the air for some time, and more especially in contact with the metal of the cans, takes on a very unpleasant tallowy odour, and the slightest portion of the fat from the old cream which adheres to the inside of the can will cause an unpleasant odour to emanate from such can. *This odour will injuriously affect fresh cream that is placed in the can.* In order to remove every particle of the old fat from the cream can, it is necessary not only to steam it thoroughly, but also to cleanse it by the aid of soda and hot water.

I would recommend also that every cream can should be sweetened by the aid of freshly slaked lime, used at least one day a week. This becomes more necessary still as the can becomes older and begins to lose a little of the tinning. No matter how well a can is cleaned at the factory, the farmer should again cleanse it before putting cream therein, because in transit back from the factory the can will have picked up a good deal of dust, and this may be the source of trouble. The cans should be cleansed in hot water, and allowed to cool without the addition of cold water, as the latter may not be at all free from microbes injurious to the cream.

Stirring of Cream.

I am quite prepared to state that if every farmer tipped his cream from one can into another at the end of every twelve hours, the quality of our cream would be improved by one or two points. This is more especially correct when applied to those farmers who keep their cream in deep cans.

Reasons for this.

Almost all the troubles that take place when cream is being decomposed, begin at the bottom of the vessel in which the cream is held. If the cream is thoroughly stirred this will not be the case, but it is very difficult to stir cream (unless by the aid of a special stirring apparatus) in a manner which will bring all the milky portion of the cream from the bottom of the can and mix it thoroughly throughout the entire mass. Also, when cream is left shut up in a narrow-necked can for some hours the odour of the can is not as sweet as might be, and the changing of cream into the other can introduces a sweeter atmosphere and gives the cream a better chance of undergoing a desirable fermentation. Some farmers keep their cream in a number of small vessels, and then mix the lot just before sending the cream to the factory. This system is not a bad one for those who send their cream to the factory daily, but is not good for those who hold their cream for two days or so in summer, before sending it to the factory. The defect in this matter is that the older cream, by this time, has become overripe, and of somewhat inferior quality, whereas if some sweet cream had been mixed with it at a proper stage, the overripeness would not have occurred. Blending of sweet and acid creams, *if sound*, has a very good effect, inasmuch as the features of the one improves the other, and the acid cream is prevented from becoming overripe. The entire lot goes through a uniform process of ripening, and the factory therefore receives a uniform article. Care should be taken, however, not to mix creams together until the fresh cream has been cooled, otherwise the temperature of the warm cream will unduly hasten the ripening of the lot, and the entire bulk will become overripe before it reaches the factory. Provided the cream is treated in the way recommended, and it is held in a clean, well ventilated place, where no bad odours reach it from any unclean surroundings, there should be no difficulty on this score in delivering choicest cream to the factory.

Transit.

Farmers who live close to the butter factories do not suffer, as a rule, by having their cream reduced in quality as the result of transit, but it is a very common occurrence for those farmers who have to send their cream some distance by rail, or even by boat.

One of the easiest methods of spoiling a cream, and giving it a tallowy flavour, is to subject it to unnecessary friction, and then allow it to stand for some time. If this friction takes place in a warm atmosphere the more readily does the butter fat become tallowy. The direct rays of the sun also have an injurious effect on the butter fat, so that neither in the dairy, nor in transit, should cream be exposed directly to the sun. If cream is very thin it is sometimes partly churned in transit; and if hot and cold cream are mixed together just prior to despatch, the cream is very often liable to become partly churned during transit. Hence, these conditions should be avoided. Cream which contains too great a percentage of butter fat is also liable to become injuriously affected by being kept for any length of time in the same can. Cream of this character, when set, does not change position in the can, and consequently the same portion is presented to the atmosphere all the time, both while awaiting and during transit. The surface of this cream now becomes what is termed oxidised; in other words the butter fat on the surface becomes changed, and acquires an odour and taste resembling inferior tallow. This, later on, becomes mixed with the whole of the cream in this can at the factory, and consequently the lot becomes inferior.

Summary.

To summarise briefly, the farmer should attend to the following points, regardless of trouble:—

1. The milk from the newly-calved cow should not be mixed with that of the rest of the herd until she has been calved at least three days.

2. The milk from a cow that is sick, more especially from one that has slipped her calf, should not be mixed with that of the rest of the herd until the cow has resumed normal health.

3. Cow manure should be removed from the bails and the cow-yard daily, and the manure heap to which this is carried should be situated sufficiently far from the dairy to prevent bad odours reaching the cream room.

4. Great care should be taken to see that the cows have access to clean running water, or where this is not possible it is advisable to let the cows obtain their water from troughs into which the water is carried by gravitation or pumping. This is more necessary in summer than in winter, and in the dry summer particularly so, as these small water pools become very easily contaminated, and the cattle take home to the dairy the worst form of cream contamination on their bodies, in the shape of the dried muddy matter that was present in such water pools.

5. See that all water used in washing the utensils is boiled, and never take for granted that the cans received from the factory are sufficiently clean to hold cream.

6. Separate the milk as quickly as possible after it has been drawn, as the separator is the best cleanser you can have. If at all possible, cool the cream after separating, and never go to bed before you have made certain that the separator has been properly cleaned.

7. Do not fail to stir the cream the last thing at night and the first thing each morning. The best method of stirring is to tip the cream from one can or vessel into another.

8. See that the dairy or room in which the cream is kept has clean fresh air constantly present, and use fly-proof doors so that plenty of air can be let in during the night. Always use a perforated can-cover for placing over the cream-can to prevent mice or rats having access thereto; a special wire can cover for the purpose is now being prepared.

9. Do not put the cream cans where the sun can have access to them while waiting for transit to the factory, and if the cream carrier has not got a waggon properly protected from the sun's rays, inform him that he is compelled by law to provide a proper protection for the cream.

10. Take care that cream is separated so that it will test not less than about 40 per cent. of butter fat in summer, and never separate it so thick that it will contain more than 45 per cent. of butter fat.

11. When a cream-can has become rusty on the inside it is no longer fit for the carriage of cream; it will pay you to discard it.

12. See that you obtain a test of your cream from the factory frequently, and at the end of each month examine your statement of accounts to note whether the overrun has been credited to you.

13. Make full provision to provide plenty of fodder for your dairy cattle throughout the entire year. It will be far better to feed thirty cows properly than to feed forty cows indifferently. Apart from the extra cost of the forty cows, the thirty cows well fed will actually produce more butter, and the man that would have to attend to the other ten cows morning and evening had better devote his time to the growing of crops in order to provide plenty of food, and a certain percentage of green feed throughout the year. If you

are short of succulent food purchase bran and make up the deficiency. Bran absorbs water very largely, and in this way helps to make up for the loss of green fodder. The bran also has a high manurial value, and therefore is benefiting the land in addition to keeping your cows in proper milking condition.

If there is any corner on your land that you think can grow lucerne, give it a trial, even if you have only one acre. Green lucerne is such an excellent fodder, and gives such good results, that special efforts should be made to secure even a small patch on every farm.

ERADICATION OF "ST. JOHN'S WORT."

THE Secretary of the Batlow Progress Association recently wrote stating that a number of holdings in that district were becoming infested with the noxious weed known as "St. John's Wort," and as efforts to eradicate it had so far failed, he sought information as to the best means of getting rid of the pest, which was undoubtedly spreading. "It is feared that unless the weed is dealt with in a thorough and systematic manner it will ultimately become a menace to the district."

"Patterson's Curse" had also made its appearance, and information was sought as to the best way of dealing with it.

The Government Botanist and Director of the Botanic Gardens reported as follows:—

The method of treating weeds depends largely on the nature of the ground and the size of the area dealt with. The purpose for which the ground is used is also a factor. In the case of "St. John's Wort" (*Hypericum perforatum* L.) if grain crops are grown, deep ploughing followed by a root crop such as potatoes is generally effective. If the soil is full of seeds, a second crop of roots may be necessary. Badly infested pasture land can only be effectively cleared by bringing it under the plough for a time, but where this is impossible frequent mowing will stop the young shoots and keep the plant in check. Poisons are generally impracticable with this species owing to their cost and uncertainty of action, very heavy doses having a bad effect on the land. This applies also in some measure to salt, which has been recommended for the destruction of this weed.

"Patterson's Curse" (*Echium plantagineum* L.) where it has obtained too big a hold for hand-pulling or hoeing, may be dealt with by running a very large mob of sheep on it and eating it bare several times a year, weakening the plants and preventing seeding.

In the Bright district of Victoria the "St. John's Wort" had got hold of thousands of acres of very stony land, creating bad seed-beds for the weed, and the ordinary methods of eradication or destruction could not apply. Both weeds are very serious.

Poultry Notes.

JANUARY.

JAMES HADLINGTON, Poultry Expert.

THE advice given in last month's notes against marketing half-grown or small cockerels during the weeks prior to Christmas has been justified by the extremely low prices obtained for these sorts; 1s. 6d. to 2s. 6d. per pair is certainly not a payable price for them, but breeders have in most cases themselves to blame, since they have been repeatedly warned that to market large numbers of these after November is to meet a glutted market. If breeders will only contrast the difference between such prices and those that more weighty birds usually make a couple of months later—namely, 6s. 6d. to 9s. 6d. per pair, or about three times the money for keeping and attending to the birds for a few more weeks, the most profitable two months—the more suitable course will be obvious. The cost of the food necessary to bring them to a good marketable size would not amount to more than a further 2s. per pair. The difference between the two propositions is that in the first case a loss was sustained, whereas in the other a good margin of profit would have resulted. The poultry-farmer cannot afford to lose money on a portion of his hatchings, nor is there any need for him to do so. The difficulty appears to be that most poultry-keepers hatch more chickens than they can accommodate.

Summer or Autumn Hatchings.

A difference of opinion exists among poultry farmers regarding the advisability of hatching during February and March. Many egg-farmers will have nothing to do with the practice, because the pullets hatched in those months are inferior layers to those hatched in the spring, whilst others, who pay more attention to table poultry, find it a paying proposition. However, circumstances will largely determine the issue.

In view of the scarcity of good table poultry from May to November even in normal seasons, it becomes a question as to what extent it is advisable to hatch during the autumn period, and the decision must largely depend upon whether the poultry-farmer's conditions are favourable or otherwise for making such a hatching. At any rate this second hatching period could be availed of by most large poultry-keepers to a much greater extent than is usually the case. The pullet portion of such a hatch will not be such good layers as those hatched in the spring (the difference might be set down as 25 per cent. in favour of the latter), but against this has to be set the fact that the pullets come on to lay early, and very high prices are available for good table cockerels which may be the product of this period's hatching.

The middle of January is not too early to commence setting the eggs, thus enabling chickens to be available from the first week in February. Chickens hatched out from that time to the middle of March usually do very well, the reason being that the warm weather is favourable to the young chickens up to say six or eight weeks old, and by the time these summer-hatched chickens have reached that age, the weather has cooled down sufficiently to enable proper development to proceed. (This is the stage at which the late spring-hatched chickens fail.) At any rate it will be found that chickens hatched in February and early March will catch up in growth to those that have been hatched during October and November; they also keep on with better development and half the loss that is frequently sustained with chickens hatched during those months.

Essentials to Success.

The factors essential to success in making a hatching at this time of the year are, in the first place, that stock that have not broken into moult are available for use as breeders. Small poultry-farmers may not have a choice of hens from which to select suitable breeders; but on most poultry farms, in a fairly large way, it is usually possible to select suitable birds. Unless this can be done, it will not be worth while attempting to hatch, because to secure good hatchable eggs and rearable chickens, the breeding stock must be at least in fair condition.

In the case of those who have followed the advice given in these notes to stop hatching about the end of September, the brooder equipment and the ground over which these out-of-season chickens might have to be run will have had sufficient spell to have sweetened them; but in the case of those who have hatched late, and who would have to run these chickens over the same ground, my advice is not to attempt it. Either ground that has remained unoccupied for a time, or entirely new ground on which to run the chickens, is essential to success.

The Growing Stock.

The young stock of last season's hatching will for the most part now require as much room as the adults, and unless this is given troubles are likely to arise. The crowding of too many pullets together in insufficient space is calculated to encourage sickness in various ways as well as to retard their development.

The most critical time in the life of growing stock, after that of the brooding stage, is from February to May. During these months chicken-pox, roup, and other diseases to which growing stock is liable, usually make their appearance. To guard against roup, little can be done except to ensure that the birds are not overcrowded in the housing quarters, and to allow all the fresh air and sunlight possible, not forgetting to thin out any superabundant scrub and undergrowth that may impede a free circulation of air through the runs.

A Precaution against Chicken-pox.

As a precaution against chicken-pox (the so-called "warts") a commencement should be made this month to give Epsom salts regularly, about every third day in the drinking water, at the rate of an ounce to the gallon. Some weeks a change to a little flowers of sulphur, instead of the salts, may be made; the right quantity to give is about a level tablespoonful to each 50 birds of adult age; this should be given in the morning mash, and evenly mixed through it. Care, however, should be taken not to give too much sulphur, or it may result in the pullets breaking into a partial moult.

Some poultry keepers give Epsom salts in the morning mash; this is wrong, and the results are not the same. The reason is that the salts impart a slightly bitter taste to the food, and any birds that are not quite keen for it will eat very little; these are the very subjects that are in most need of the medicine. But all have to drink water, therefore under this method they get their share of the salts. This is why many poultry-keepers fail to completely protect their flocks from chicken-pox by this simple treatment.

The quantity of Epsom salts given in this way has only a slight laxative effect, and can in no sense be considered a purgative dose.

Seasonal Troubles.

Protrusion of the Oviduct.—Protrusion is often the result of strain from a hen having laid an abnormally large egg, but sometimes results from a weakness of the oviduct itself, which may be constitutional or otherwise. Protrusion may also be the result of an accident. When this trouble arises from strain, the cure presents no difficulty. The part should be washed with clean water made pink with permanganate of potash, and the surplus moisture dried off; then the part should be lightly dusted with very finely powdered alum or washed with a fairly strong solution of water, and the oviduct returned to its natural position.

Soft-shelled Eggs.—Soft-shelled eggs, or eggs laid without a shell at all, are most frequently incidental to aged hens, or may arise from disease or weakness of the oviduct, or over-stimulation consequent upon feeding condiments. Still another cause is the lack of proper shell grit to supply the necessary shell-making material. Hence, when this trouble occurs the supply of grit should be looked to at once. It should be understood that ironstone, or grit containing little or no lime is useless for the purpose of supplying shell-making material.

Feather-eating.—This trouble is brought on by many things. In some cases it is an acquired habit; in others it is brought on by some deficiency in the ration, such, for instance, as common salt. It may also be the result of over-stimulation by feeding condiments. Want of sufficient shell grit is still another cause, while many cases occur where the causes are obscure, and not easily accounted for. Feather-eating rarely occurs among poultry run on free range, but it is a most conspicuous feature with poultry confined to small yards where no scratching material is provided. Placing the perches too close is a very frequent cause, and it is likely to accentuate the trouble once it has started.

Very little can be done that is likely to break the birds of the habit, except to find out the deficiency and remedy it. The birds will usually remain in that condition until they have moulted. Dipping in a weak solution of bitter aloes will sometimes help matters.

Agricultural Bureau of New South Wales.

Season's Greetings.

As forecasted at the commencement of last year the progress of the Agricultural Bureau has been satisfactory during the past twelve months, there being now 119 *branches as compared with a total of* 111 *at* 31*st December,* 1915.

There is no doubt that greater expansion would have taken place, but for the fact that farmers have been handicapped in the work of organisation owing to numerous enlistments of members of the farming community for Active Service. It is confidently anticipated that the prospects which prevailed prior to the advent of the war will be realised in the near future.

On behalf of the Minister for Agriculture and the Staff of the Department, I take this opportunity of conveying Hearty Season's Greetings to all members of the Bureau.

George Valder

Under Secretary and
Director of Agriculture.

Sydney, 2*nd January,* 1917.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

SINCE the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*. Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Each branch when formed is supplied with a set of available *Farmers' Bulletins*, and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Blacktown.

The annual meeting of this branch was held on 12th December. The report remarked on the unabated interest in the work, and the usefulness of several of the fixtures of the year. The membership had increased from thirty-eight, twelve months ago, to fifty-six at the time of the meeting. The Treasurer had a very satisfactory credit balance to carry forward. Four new members were elected.

Cotta Walla.

A meeting was held on 14th November when the Secretary, Mr. T. A. Howard, read a paper, from which the following is taken:—

POTATO GROWING.

The potato certainly holds first place among vegetables, and the importance of the crop can hardly be over-estimated, especially when we consider the enormous quantities annually consumed in our large towns. Anything that can be done to improve its quality and production is therefore of interest to farmers, and particularly in a district where the soil and climate are suitable for its production.

Potatoes require good, deep, rich soil—the best land on the farm. Although by the use of artificial fertilisers, and under favourable weather conditions, good crops can be grown on inferior land, still virgin soil is preferable for potato growing.

It always pays to have the land well worked, and of good tilth before the planting season. To accomplish this, the land should be fallowed 6 or 7 inches deep during August and September, and then regularly harrowed and cultivated to pulverise the soil, conserve moisture, and to keep weeds under control.

The seed should be carefully selected. It should be free from skin diseases or grubs, and true to variety. As regards size, I prefer it to run from the size of hens' eggs to half pound weight, the latter size to be cut into two or three sets. Of course, this method requires a greater quantity of seed, but I think it produces healthier and stronger plants.

with a greater likelihood of marketable potatoes. The risk of planting small seed is that small potatoes are either the late-formed tubers of strong vigorous plants, or the product of plants of low vitality. The former class will probably yield as well as the parent plant, but the latter class can only be expected to produce a poor crop of indifferent quality. Thus if small seed were planted year after year, the grower would be propagating inferior plants, and he could not expect the heavy yields of good quality potatoes—that should be the aim and object of every potato grower. The only possible points in favour of small seed are (1) that it is economical, and (2) that small uncut seed will generally give 90 to 100 per cent. germination.

The seed should be sown 4 to 5 inches deep during the month of November, in rows 2 feet 6 inches apart, and 2 feet between the sets in the row. The land should be harrowed down after planting, for if left open the moisture quickly evaporates. Later on, when the potatoes are just coming up, the land should be cross-harrowed ; this will check the weeds and will not hurt the plants. The crop should be scarified during the growing season to keep the weeds down, but I do not think hilling is at all beneficial to potatoes.

The varieties most suitable for a main crop in this district are Up-to-Date and Magnum Bonum. The former grows a number of well-shaped, good quality potatoes on each root, and is a most prolific yielder if weather conditions are favourable. Magnum Bonum is certainly the surest cropper of all, being of very hardy, vigorous growth, and gives good results (both for yield and quality) even in droughty seasons. Several new varieties have been introduced into the district lately, and although not giving very good results, yet they will probably improve when they become better acclimatised.

DISCUSSION.—Most of the members considered that the land should be ploughed in May and June, so as to receive as many frosts as possible, which are very beneficial to the soil.

As regards harrowing the crop after it comes up, some members stated that their opinion was, that it should be harrowed until the plants were 6 or 8 inches high.

It was generally considered that Carman and Brownell's Beauty were just as suitable for this district as those already mentioned.

Garra-Pinecliff.

The annual meeting and election of officers was held at Mr. H. Robards' residence. The report indicated that the year's work had been a satisfactory one. The following officers were elected :—Chairman, Mr. H. W. Bradley ; Vice-Chairman, Mr. P. Rubie ; Treasurer, Mr. S. Robards ; Hon. Secretary, Mr. S. W. Packham.

It was decided that meetings should not be held in December and January, owing to members being engaged with the harvest.

Holbrook.

Mr. H. C. Stening, Inspector of Agriculture, delivered a lecture on wheat culture at the local wheat experiment plots on 16th November. In spite of wet weather the attendance was satisfactory. At the conclusion of the lecture many questions were answered by the lecturer.

Kellyville.

A meeting was held on 2nd December. A discussion took place on the recent summer-thinning demonstration by Mr. W. Le Gay Brereton, Assistant Fruit Expert.

Martin's Creek.

The annual meeting was held on 19th November. The annual report of the Secretary showed that good work had been done by the branch during the year.

The following officers were elected:—Chairman, Mr. T. J. Martin; Vice-Chairmen, Messrs. F. Martin and A. Vogele; Treasurer, Mr. J. Robinson; Hon. Secretary, Mr. P. Laney.

It was decided that the meetings should in future be held on the Friday before the full moon in each month.

Matcham.

A meeting was held on 4th November at which a paper on citrus culture was read by Mr. C. Marks, and was followed by a discussion.

Middle Dural.

A meeting was held on 1st December. There was a vigorous discussion of several matters of interest to fruitgrowers. The question of securing better attendances at the meetings was also raised.

Miranda.

A meeting of this branch was held on 20th November when an instructive paper was read by Mr. F. C. Sergeant on the principles of animal nutrition, with special reference to poultry.

Penrose-Kareela.

The annual meeting of this branch was held at Penrose on 12th November, and the election of officers resulted as follows:—Chairman, Mr. J. Mashman; Vice-Chairman, Mr. G. Johnson; Treasurer, Mr. V. James; Hon. Secretary, Mr. H. R. Parkes.

The subscription fee for the ensuing year was fixed at 2s. 6d. The balance-sheet showed a credit balance of £7 5s. 2d.

Spencer.

A meeting was held on 25th November at which a paper was read by Mr. Austin Woodbury, junior. From it are taken the following paragraphs:—

LEMON CULTURE.

The title to this paper has been taken in its very broadest sense, so as to include the whole business of growing lemons, from the planting of the trees to the despatch of the fruit. The paper must be brief, however, and can only be suggestive.

The first item is, of course, the selection of a site. The advantages and disadvantages peculiar to different situations and different kinds of soil must be duly considered. An open situation, with a temperature fairly warm, is to be preferred. The severe frosts of the winter are sometimes very destructive to the summer crop of fruit, which, at the time, is young and delicate. As for soil, the loamy valleys of this particular locality are very good, and the stiffer ground of the hillsides can by no means be despised. By reason of the fact that lemon trees are, under some circumstances, rather inclined towards "bark rot," great attention must be paid to drainage. A good subterranean system, with necessary surface trenches, is generally the most serviceable.

With respect to the most appropriate varieties of lemon trees, the Lisbon and Sweet Rind can be particularly commended. The latter bears a profitable summer crop, but for vigour and form the tree is not equal to Lisbon, which, on the other hand, can be brought to yield an early main crop, fit for market when lemons are very scarce and very high priced. This can be done by timely manuring. An application of a nitrogenous fertiliser about July, and another later in the spring, will, under ordinary conditions, meet requirements. The mixture commonly called blood and bone, as a rule suffices for the purpose.

More especially in the summer time, the ground will need to be thoroughly cultivated, in order to conserve the greatest possible amount of moisture for the combating of the droughts that occasionally threaten, if not the existence, at least the productivity of the orchard.

The principal enemies of the lemon producer are white lice and red scale. The former can be held in check with the lime-sulphur spray, and the latter with red oil emulsion.

As to the marketing of the fruit, I find it very advisable to class the lemons, but there is not sufficient recompense obtainable to warrant methodical packing, much less curing and wrapping. Growers are often criticised for what is said to be their laxity in this respect, but I deliberately and emphatically repeat that no adequate reward is procurable for the extra labour and cost entailed in attempting to compete in this respect with the products of Italy. It may be different in the case of a man who grows lemons to a very unusual extent, and who is renowned for his position among the buyers who frequent the fruit markets, but I am speaking of growers as we know them, and to them my remarks apply.

Tallawang.

A meeting was held on 25th November when Mr. T. Collins read a paper criticising the bulk-handling scheme. From it the following is taken :—

THE BULK-HANDLING SCHEME.

I am not by any means against bulk-handling as a principle; in fact, I recognise that, when the attendant details are brought to an efficient working basis it must, and will, make for expeditious and efficient handling. It must be understood, however, that what is suitable for the wheat-carrying problem of America is not necessarily suitable for here.

In the first place, it is safe to say that that farmer is non-existent who will say, "we will not have bulk handling," when it has been demonstrated that his crop will be handled just as efficiently and at no greater cost under the new than under the old system. So far as the question of lost bags in transit is concerned, I am inclined to doubt whether the loss is anything like as great as it would be with leaking bulk trucks. And this brings me to my principal point of opposition. I am not of opinion that the conduct of the scheme in its entirety by the Government will make for efficiency, and therefore for the greatest return to the producer. I am by no means convinced that the grading of the wheat by a Government official will be to the best interest of growers. Let the Government erect a grain shed at the local siding, provide the bulk truck, and allow me to sell in the best market I can find for myself, and I am satisfied that I will obtain a better return for my invested capital and labour, and that the consumer will obtain just as cheap a loaf, as is likely to be the case where the Government conducts the whole of the business, from the time the wheat leaves my hands. The farmers have dangled before their eyes the so-called fact of a saving of 2d. a bushel. Under a scheme of handling by shippers in open competition, he may be near the mark, but when the multiplicity of officials receive their usually exorbitant salaries, when the interest on the cost of the enormous terminal elevators as well as on the two hundred country elevators, together with a sinking fund, are adjusted, when the alteration of rolling stock and the building of new rolling stock is paid for—for these are all legitimate charges on the scheme at its inception, which the farmer must pay directly or indirectly—the result may be a deficit of twopence. To my mind, it would have been far better to have "hastened slowly." I think you will agree that the erection of one terminal elevator, the working of one or two of the larger country wheat stations under the bulk system, together with the chartering of, say, two steamers for the first season, would have made for a more efficient system when finally introduced.

Finally, if the Government adopted a system of handling the wheat in bulk through merchants on whom they could enforce regulations in conformity with pure food laws, the consumer would get pure food cheap, the farmer would get a better return and certainly more satisfaction than is possible if the present authorities are to be given the carrying out of the proposed system.

An animated discussion followed, several members favouring Government handling.

Thyra-Bunaloo.

A meeting of this branch was held on 4th November when Mr. W. Glenn read a paper on the best wheat for seed, for fodder, and for both purposes in the district. He stated that Federation and Yandilla King were the best wheats for the district, and quoted the experiments conducted at the Government experiment farms in support of his contention.

A keen discussion followed the paper.

Warner's Bay.

A meeting of this branch was held on 6th December. The literature supplied by the Department was examined, and it was decided that at the next meeting a discussion be held on rotation of crops.

Woonona.

A meeting was held on 14th November which was attended by thirty members.

Mr. George Fowler continued his paper on fruit and vegetable pests and their treatment. The chief points dealt with were peach leaf curl, water-rot of the apple, sap-choke, root rot, San José scale, and woolly aphis. The paper was followed by questions and a discussion.

The Chairman (Mr. Coltman) commenced a paper on the production of honey. He traced the history of the bee from the laying of the egg to the honey-gathering stage. Swarming and the mating of the queen were dealt with, and attention was given to the diseases of bees. Mr. Coltman's paper is to be continued at the next meeting.

Yarramalong.

A meeting was held on 25th November when a committee was appointed to canvass the district for new members.

The Government proposals with regard to the flying-fox pest were discussed, and those present expressed their satisfaction with the scheme. As bad weather had interfered with the attendance, it was decided to call a special meeting to decide whether the offer should be accepted.

A disease which had recently appeared in the potato crops in the district was discussed, the question being raised whether it was really Irish blight.

Yurrunga.

On 14th October Mr. F. Wigan, Dairy Instructor, gave a lecture at Yurrunga. He dealt with the feeding and management of a dairy herd, and the selection necessary if profits are to be the chief consideration. He also dealt with the quality of creams supplied, and the relation of margarine to the industry and especially second-quality butter.

The lecturer also discussed the causes of inferior cream and the question of sending good quality cream to the factory. Some of the provisions of the Dairy Industry Act were also explained. A number of questions were asked and answered. Over twenty members were present, and the meeting was a very profitable one.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Braun, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	A. J. Alcock, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Boolaroo	J. Raw, Fairfax-st., Spier's Point.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Brocklesby	J. Hunter, Brocklesby.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Bay Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	V. Gooley, Private Mail Bag, Casino.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	J. Clatworthy, Millpose, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	F. A. March, Cordeaux River, Mt. Kembla.
Coreen-Burraja	
Corowa*	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
	M. Knechtli, Hillston.
Holbrook	F. J. Gifford, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne	Sylvester Kennedy, Jindabyne.
Katoomba	W. E. Parry, Victoria Road, Katoomba.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Lankey's Creek (Jingellic).	G. J. Nichols, P.O., Jingellic.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A. E. J. Anderson, B.A., Platform-street, Lidcombe.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.

Branch.	Hon. Sec.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	H. R. Parkes, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Rawsonville	H. R. Beattie, Rawsonville, via Dubbo.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	D. J. Dougherty, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, Wyalong W.
Spencer	P. A. Edwards, Public School, Spencer.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Thyra-Bunaloo	C. H. M. Smith (*pro tem*), Thyra, via Moama.
Toronto	
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Wetherill Park	L. Rainbow, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	A. Cavill, Campbell-st., Woonona.
Wyan	
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yass	
Yetholme	N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca.	R. Waples, Yurrunga.

Orchard Notes.

JANUARY.

W. J. ALLEN.

Cultivation.

THE rain during the first part of the summer put back all cultivation. Where this work is not already in hand, no time should be lost in getting all weed growth under, for if the latter part of the summer is dry, the trees and fruit will suffer from lack of moisture.

Marketing.

The picking of summer fruits should be regularly carried out, so that they will be packed and marketed in a firm condition, as very often the retailer has to hold the fruit some time before disposing of it. Fruit for the fresh fruit market should be even-sized, graded and packed, so that from whichever side it is opened it has an attractive appearance.

Summer Thinning.

When deciduous trees are making very heavy growth, especially when they have been topped the previous winter, and consequently excluding light from the interior of the tree, it is beneficial to thin out some of this growth. By doing this more sunlight is directed towards the centre of the tree, and, in consequence, the wood will mature better, and fruit buds and spurs will be more numerous and robust. In order to get sufficient light to colour some fruits one cannot thin enough by cutting these growths right out. and where it is necessary to top laterals back. This should only be done three or four weeks prior to picking the fruit, as otherwise the trees are likely to make several shoots from where the laterals are topped, and the tree will consequently be denser than ever. All young trees should be looked through regularly, as often strong growths will be made from points not required, which, if not removed, will sap the other necessary shoots. The tree can also be kept more even by checking the shoots on the vigorous side during the summer.

Citrus Scale.

The past few seasons have been very dry generally, which has prevented the early spraying or fumigating of citrus trees for scale insects. The trees this season should be in strong condition owing to the copious rainfall received during the first half of the summer, and, should a few seasonable showers fall in the new year, be in fit condition to stand either fumigating or spraying during January and February. The hatching period of scale insects varies to some extent from season to season. A careful watch should, therefore, be kept, and an endeavour made to deal with them when all the eggs have hatched and before any of the young have developed their hard covering. Fumigation should only be carried out on absolutely cloudy cool days or dewless nights. Spraying should be avoided during very hot days.

Fruit Fly.

All infested fruit should be collected and either burned or boiled.

Codlin Moth.

In districts where this pest is prevalent it is advisable to give late hanging varieties of apples a spraying this month. In the majority of districts the apple crop this season is light. It is generally found that when the crop is light there is a higher percentage of moth than when the trees are bearing heavy crops. On the other hand, light crops are more easily inspected and affected fruit more easily collected and destroyed.

When the destruction of the moth can be carried out before the grub leaves the fruit a big reduction is made in the number of moths later in the season, and the first brood for the following season is also reduced. In addition to collecting and destroying infested fruit as prescribed by the "Vine and Vegetation Diseases Act," it is also advisable where moth is prevalent to use bandages on the trees.

Growers should not relax their efforts in combating this pest on account of the light fruit crop, but rather take the opportunity of the lessened labour and fight it more vigorously. If this be done more beneficial results will be obtained.

Fruit Curing.

Apricot drying will be completed this month, and some of the earlier peaches suitable for curing will be ripening. The firmer yellow-fleshed varieties, such as Crawford and Elberta are the most suitable. Care should be taken that they are fully ripe before picking for curing. The fruit when cured should be pliable and not hard like chips, and as soon as removed from the tray should be stored in calico bags until packed for sale.

Re-working Old Trees.

Trees of poor or unprofitable varieties can be budded over to better varieties this month. Buds should be selected from robust trees that have cropped well for some years. When budding into large limbs that have not been previously cut down to encourage young shoots to work on, it is a good plan to place a bud in both the upper and lower sides of the limb, as the sap is then drawn on both sides, and the big stump heals over very much more quickly.

Cover Crops.

It is a good plan to order seed for the cover crop early this month, so that it can be sown without delay after the first suitable rains in February. A plant that will give a heavy growth during the autumn and winter months is the main essential. Legumes have the advantage of adding nitrogen obtained from the atmosphere to the soil when ploughed in. Unfortunately, a suitable winter-growing legume cannot always be found for all districts. Black tares and peas are good cover crops for many of the coastal districts, but rye has been found a more certain crop inland and on some of the tableland areas.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.		Stationed at—	Engaged up till—
Shorthorn ...	Melba's Emblem (Vol. IV, M.S.H.B.)	Emblem of Darbalara (100 M.S.H.B.)	Melba 3rd of Darbalara (1058 M.S.H.B.)	Berry Farm ...	‖
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	H. A. College ...	*
,, ...	Trafalgar ...	Best Man ...	Rum Omelette	Cowra Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Yanco Farm ...	*
,, ...	Leda's Retford Pride.	Dinah's Lad ...	Leda's Angel..	Wagga Farm ..	‖
,, ...	Goddington Noble XV (imp.)	Goddington Noble	La Franchise 3rd.	,, ...	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	H. A. College ...	‖
,, ...	Janet's Queen IV Brighton of Coolangatta.	Brighton King of Coolangatta.	Janet Queen IV of Coolangatta.	,, ...	*
Guernsey ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Wollongbar Farm	‖
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	George III ...	King of the Roses	Calm 2nd ...	Wollongbar Farm	‖
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Wollongbar Farm	*
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (imp.).	Woodburn ...	30 Dec., '16.
,, ...	Belfast	King of the Roses	Flaxy 2nd ...	Boorie Creek ...	23 Mch. '17.
,, ...	Alexander the Great	Claudius (imp.).	Alexandrina of Richmond	Kempsey	— Nov., '16.
Ayrshire ...	Isabel's Majestic (861 A.A.H.B.)	Majestic of Oakbank.	Isabel of Gleneira.	Grafton Farm ...	‖
,, ...	Auchenblae of Grafton (Vol. X A.A.H.B.)	Isabel's Majestic (861 A.A.H.B.)	Rose Auchen of Grafton (Vol X, A.A.H.B.)	Glen Innes Farm..	*
,, ...	Roderick of Willowvale (Vol. X A.A.H.B.)	Lancer of Willowvale (757 A.A.H.B.)	Freida of Gleneira	Grafton Farm ...	*
Holstein ...	Sultan La Polka (imp. N.Z.)	King of Dominos (297 N.Z.H. & F.H.B.)	Princess La Polka (292 N.Z.H. and F.H.B.)	Berry Farm ...	*
Kerry.. ...	Castle Lough Ranger (imp.)	Waterville Rover	Castle Lough Lizzie.	Bathurst Farm ...	*

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* Available for service only at the Farm where stationed.

‖ Available for special service where stationed upon application to the Under Secretary.

BULLS FOR SALE

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Faithful Fido (49): born 5th May, 1915; colour, fawn and white; sire, Hayes' Fido (imp.); dam, Faith (48 A.G.H.B.), by Prince Souvia, from Miss Clatford of Wollongbar (imp.); by Clatford Hope II (1814 E.G.H.B.); from Clatford Hopeful (imp.). Price, **60 guineas.**

Milk record of dam for 7 months—3,894 lb. milk and 246·33 lb. butter.

This record was made during the dry spell, and the cow had only two teats yielding milk.

General Sairrail (58): born 4th December, 1915; colour, fawn and white; sire, George III (15 A.G.H.B.); dam, Psyche (157 A.G.H.B.), by Calm Prince (2), from Bel Air VI (imp.) (5802 P.S.R.G.A.S.) Price, **40 guineas.**

Milk yield of dam, 3-year old—4,448 lb. milk and 255·97 lb. butter in 243 days.

AT GRAFTON EXPERIMENT FARM.

AYRSHIRE.—Jamie of Grafton: born 25th December, 1915; colour, red and white; sire, Isabel's Majestic (861 A.A.H.B.); dam, Jamie's Rose (Vol. X, A.A.H.B.); by Jamie's Heir, from Auchen Rose; by Daniel of Auchenbrain (imp.), from Primrose II; by General, from Miss Prim; by Mischief Maker of Barcheskie (imp.), from Primrose of Barcheskie (imp.). Price, **20 guineas.**

AT BATHURST EXPERIMENT FARM.

KERRY.—Graduate of Bathurst: born 10th March, 1916; colour, black; sire, Castle Lough Ranger (imp.); dam, College Beauty, by Bratha's Boy, from Bathurst Beauty; by Kildare II, from Lady Critic; by Belvedare Gay Knight (imp.), from Aicme Comment (imp.) Price, **10 guineas.**

Milk yield, 3-year old—7,538 lb. milk and 350·28 lb. butter in 365 days.

AT HAWKESBURY AGRICULTURAL COLLEGE.

JERSEY.—Laddy (66): born 5th November, 1915; colour, whole; sire, Dinah's Lad (400 A.G.H.B.); dam, Katarina IV (2142 A.G.H.B), by Magnet's Boy XVIII (159 A.G.H.B.), from Katarina III; by Magnet's Boy II, from Katarina; by Chaplin (imp.), from Little Katie (imp.). Price, **20 guineas.**

Milk record for 5 months (incomplete)—3,330 lb. milk and 211 lb. butter.

AT BERRY EXPERIMENT FARM.

HOLSTEIN.—Pete of Berry (22): born 17th October, 1915; colour, black and white; sire, Duke of Amsterdam; dam, La Hook II, by Froxfield Cherin Bob (imp.), from La Hook; by Hollander, from Queen Margaret (imp.); by Max (3128 F.H.B.), from Margaretha (imp.) 10439 F.H.B. Price, **18 guineas.**

Milk yield of dam, 3-year old—5,874 lb. milk and 241·20 lb. butter in 273 days.

AT GLEN INNES EXPERIMENT FARM.

AYRSHIRE.—Bruce: born 27th March, 1916; colour, dark red, little white; sire, Wyllieland Bright Lad (imp); dam, Mystery, by Jamie's Heir, from Juliette; by Mischief-maker of Barcheskie (imp.), from Judy IX of Barcheskie (imp.). Price, **10 guineas.**

Milk yield of dam—5,007 lb. milk and 251·70 lb. butter in 273 days.

GEORGE VALDER,
Under Secretary and Director of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Alstonville A. Society	C. D. McIntyre	Feb. 7, 8
Berry A. Association	A. McConaghy	Abandoned.
Pambula A., H., and P. Society	M. E. Stewart	Feb. 14, 15
Central Cumberland A. and H. Assoc'n (Castle Hill)	H. A. Best	Feb. 16, 17
Dapto A. and H. Society	J. J. Cook	,, 21, 22
Wyong District A. Association	W. Baldwin	,, 23, 24
Gunning P., A., and I. Society	S. A. Beer	,, 27, 28
Albion Park A., H., and I. Association	J. Caldwell	,, 27, 28
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 27, 28
Dorrigo A., H., and I. Society	R. R. Blair	,, 28; March 1
Newcastle A., H., and I. Association	E. J. Dann	Feb. 28; March 1, 2, 3.
Robertson A. and H. Society	R. Graham	Mar. 1, 2
Inverell P. and A. Association	J. McIlveen	,, 1, 2, 3
Bangalow A. and I. Society	W. H. Reading	,, 6, 7
Yanco Irrigation Area A. Society	F. D. Inman	,, 6, 7
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 6, 7, 8
Tenterfield P., A., and M. Society	R. G. White	,, 6, 7, 8
Braidwood P., A., and H. Association	L. Chapman	,, 7, 8
Coramba District P., A., and H. Association	H. E. Hindmarsh	,, 7, 8
Tumut A. and P. Association	T. E. Wilkinson	,, 7, 8
Manning River A. and H. Association (Taree)	L. Plummer	,, 8, 9
Crookwell A., P., and H. Society	M. P. Levy	,, 8, 9
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne	,, 8, 9, 10
Nepean District A., H., and I. Society (Penrith)	P. Smith	,, 9, 10
Queanbeyan P. and A. Association	J. G. Harris	,, 13, 14
Glen Innes & Central New England P. & A. Assoc'n	G. A. Priest	,, 13, 14, 15
Cobargo A., P., and H. Society	T. Kennelly	,, 14, 15
Gundagai P. and A. Society	A. Elworthy	,, 14, 15
Moruya A. and P. Society	H. P. Jeffery	,, 14, 15
Nambucca A. and H. Association (Macksville)	M. Wallace	,, 14, 15
Nimmitabel A. and P. Association	O. E. Silk	,, 20, 21
Quirindi District P., A., and H. Association	A. N. Pountney	,, 20, 21, 22
Armidale P., A., and H. Association	A. McArthur	,, 20,21,22,23
Molong P. and A. Association	W. J. Windred	,, 21
Delegate P. and A. Association	F. Mullaney	,, 21
Camden A., H., and I. Society	A. E. Baldock	,, 21, 22, 23
Batlow A. Society	C. S. Gregory	,, 27, 28
Tamworth P. and A. Association	J. R. Wood	,, 27, 28, 29
Walcha P. and A. Association	J. N. Campbell	,, 28, 29
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 28, 29, 30
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 28, 29, 30
Royal Agricultural Society of N.S.W.	H. M. Somer	April 3-11
Clarence P. and A. Society (Grafton)	G. N. Small	,, 18, 19, 20
Orange A. and P. Association	W. J. I. Nancarrow	,, 18, 19, 20
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 18-21
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 25, 26
Dungog A. and H. Association	C. G. Grant	May 2, 3
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 3, 4, 5
Kyogle P., A., and H. Society	D. Campbell	,, 9, 10
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 21, 22, 23
Parkes P., A., and H. Association	G. N. Seaborn	,, 22, 23
Forbes P., A., and H. Association	J. H. Bates	Sept. 4, 5
Manildra P. and A. Association	A. Anderson	,, 5

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Agricultural Gazette of New South Wales.

Grasses and Clovers under Irrigation.

FURTHER TRIALS AT YANCO EXPERIMENT FARM.

J. M. PITT, Experimentalist.

[Special attention is drawn to the results obtained from Bokhara clover, Subterranean clover, Chilian clover, and the Burrless Medics, as described in the following report. Bokhara clover should have its uses on the Area for preparing land for lucerne. Its deep-rooting habit and the fact that the Bokhara clover nitrogen-secreting organism will satisfactorily inoculate soil for lucerne (according to the best American authorities), have special significance for farmers on the Area. An investigation into the seed-forming habits of Chilian clover has shown that from twenty heads 70 per cent. of the flower-pods were filled with seed. If these seed-forming tendencies are maintained, the success of the clover seems assured. The value of the native grasses under irrigation cannot be over-estimated. Unfortunately, great difficulty has been experienced in getting the seed of some to germinate satisfactorily. The *Danthonia, Panic,* and *Andropogon* grasses germinate much better than the *Chloris, Sporobolus,* and *Eragrostis* genera. An irrigated *Danthonia* pasture on the Farm provides a large amount of feed during the greater part of the year.—E. BREAKWELL, B.A., B.Sc., Agrostologist.]

ALTHOUGH up to the present experiments with grasses and clovers have only been carried out in a small way, such as growing in rows or small plots, still results sufficiently encouraging have been obtained to justify trials on a larger scale.

As dairying promises to be one of the main industries of the Murrumbidgee Irrigation Area, it is desirable that the dairy farmer should have some authentic data to guide him in making provision for suitable pastures, in order that he may carry out his work successfully.

On many of the farms allotted to dairying there are tracts of second and third class land practically unsuitable for agricultural purposes owing to their inferior soils and the cost and difficulty of working them, but which, with very little trouble and expense, could be turned to better and more profitable use by the improvement of the pastures on lines that would make them permanent. At the present time, owing to the dry atmospheric conditions of the summer, the natural pastures are seldom available, except in good years, for five to seven months of the year. By selecting and growing some of the tried cultivated grasses and clovers, by allowing the paddocks to become thoroughly established before grazing, by practising judicious stocking, so as to allow desirable varieties ample opportunities to propagate themselves, by applying water at intervals, and by carefully cultivating and manuring when necessary, suitable nutritious herbage would be available for the greater part of the year. Not only could a larger number of stock then be kept, but yields and profits would be greatly increased.

In a few isolated cases on the Area small plots have been grown with different varieties of grasses, giving good results, but no systematic method of laying down pastures has yet been adopted whereby a succession of green succulent fodder would be available during the greater part of the year.

In laying down a pasture some of the following grasses and clovers (additional to those mentioned in an earlier article as growing at the Experiment Farm) should be worthy of inclusion :—

Grasses.

Phalaris bulbosa.—Without a doubt this is the most promising winter, spring, and early summer perennial grass we have. It withstands the severest frost, giving large quantities of soft, succulent, dark green foliage. It grows rapidly during September and October, reaching nearly 5 feet in height. It has a tufted or clumpy habit, stooling well, and throwing up seed stalks during November. Seed sown during early autumn gives excellent feed the following spring. Even on stiff clay soil that is somewhat difficult to work into a proper seed-bed, good germination took place. Although best results are probably obtained from this grass when growing in cooler and more moist climates, there is no hesitation about recommending it for pastures in these parts, where it would have the advantage of water when necessary. Care must be taken to allow the plants to produce seed occasionally.

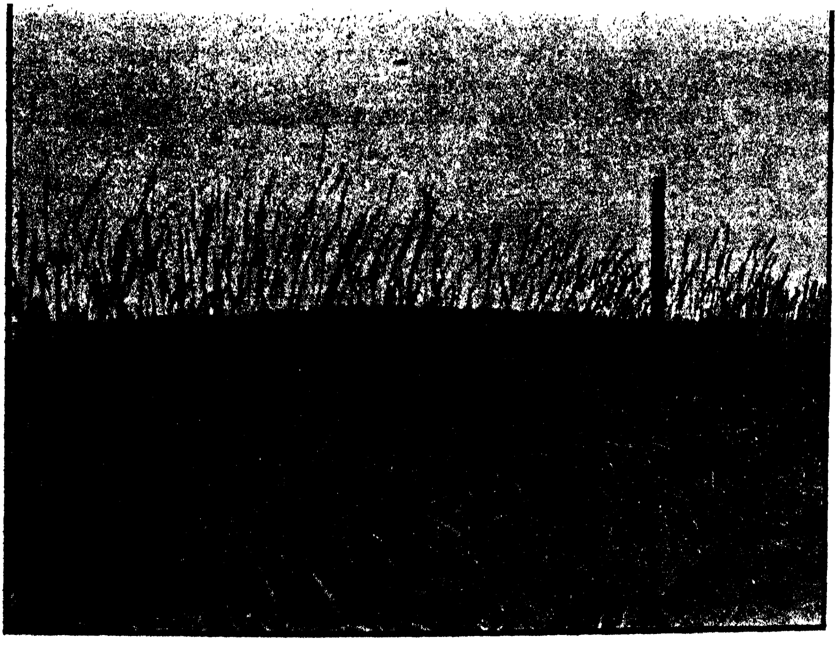
Lolium westernwoldicum.—This is a species of rye grass, somewhat resembling Italian rye, which was introduced from Holland. Sown this year during March, the plot made exceptionally fine growth throughout the winter and spring months, stooling profusely, and eventually throwing up seed heads towards November. Seed is borne in large quantities. It produces an abundance of soft shiny, medium-narrow leaved foliage, reaching over 2 feet in height before seeds appear. Grown in the poorest shallow clay soil with a stiff clay band underlying, a growth of 3 feet 6 inches was obtained. Westernwolth's rye grass surpasses Italian in its rapidity of growth and quantity of herbage. Although not grazed here, in other parts as many as five and six feedings or cuttings have been made from both autumn and spring sowings. For these reasons, as well as because it is a heavy seeder and good fodder, it should be valuable for inclusion in pastures.

Bromus japonicus is somewhat similar to the ordinary prairie grass. It makes rapid growth during the winter and spring, the foliage being broad-leaved and plentiful. After the seed stalks appear in October, the grass has a harsh feeling. It is an abundant seeder, and providing it is eaten off in the young stages and allowed to seed once a year it should be good for pastures.

Eriochloa annulata is a native perennial grass, growing well from spring to autumn. The leaves are fairly narrow, but with the stalks, which are succulent, they produce good herbage. The plants start well, and towards late autumn yield large quantities of seed. Under cultivation it makes excellent growth. It is often to be found growing wild along ditches on headlands, and in neglected cultivation paddocks, and as it is a good drought resister and stands stocking (cattle being very fond of it) it should be an excellent grass to include in a pasture for spring, summer, and autumn use.

Andropogon intermedius is a native perennial grass, growing during the warmer months. The plants stool well, forming thick clumps; the leaves are narrow. It stands dry conditions very well. Although it could hardly

Plot of Westernwolth's Rye Grass being cut for seed. Height, 3 feet.



Phalaris bulbosa, showing 7 months' growth. Nearly 5 feet high.

GRASSES AND CLOVERS UNDER IRRIGATION AT YANCO EXPERIMENT FARM.

be classed as a good grass from a dairyman's point of view, it is well worthy of a trial. Under cultivated conditions it gives a greater quantity of softer foliage than when growing naturally.

It has been noticed that once the native grasses become established they do remarkably well, especially under cultivated conditions. Not only are they great drought-resisters, but they respond well to the smallest application of water. Being available during the warmer months of the year, when all other herbage is practically finished, it is advisable that they should be grown more extensively.

Of the native grasses previously mentioned the following again did well, all varieties yielding large quantities of herbage and seed :—*Panicum prolutum* and *Andropogon sericeus.*

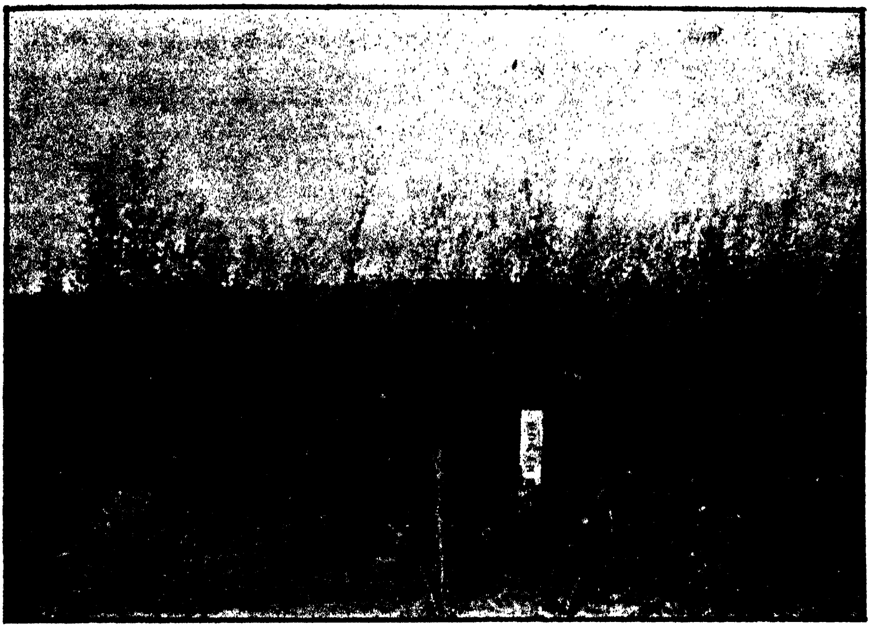
Of the other grasses, Sudan again did remarkably well, the records proving it to be the heaviest yielder, the best drought-resister, and the most useful warm weather grass we have. About 10 tons of green fodder to the acre was obtained from three cuttings of the plot sown last year. This season it again promises to give high yields.

Bromus inermis, Para ; *Setaria nigrirostis,* Grama ; and *Bouteloua curtipendula,* all did well.

Clovers.

Trifolium subterraneum.—This is one of our most promising clovers. It probably gets its name from the habit of growth, the lowermost shoots forcing their seed-pods into the soil in readiness for future propagation. It has made exceptionally good growth this winter, which is its second season. The stems, all of which are green and succulent and carry a fair amount of leaf, have grown over each other to a depth of fully 5 or 6 inches, completely filling the spaces in between the rows (2 feet 6 inches apart) and now forming a dense mat. The leaves are inclined to be a little hairy. Growth commences about March and continues well into the spring ; in fact, the bed is still, at the date of writing (23rd November, 1916), quite green. Although not grazed here, in other parts it has been fed off continually and found to be very useful. Its lower stems cling to the ground ; it is thus protected from being killed out by stock. Owing to its seeding capabilities, which are important, and its being a succulent nitrogenous fodder, it is worthy of a place in any pasture, especially for winter and spring use.

Chilian Clover.—This variety has again made good growth, throwing up a great bulk of soft succulent foliage, and is now (November) in flower. Formerly it was understood that the Bumble bee was necessary to fertilise Chilian and Red clover, but last season this theory was found to be incorrect —a fair amount of seed being collected, which, on being sown late in the autumn, germinated and grew very satisfactorily. Chilian clover has all along been one of our best clovers, and now that it is known to seed freely it may be said to be of increased value.



Bokhara Clover (Australian type).
Long flower shoots, reaching over 6 feet in height.

Bokhara Clover (American Strain).
A few stems of Australian type in background, and Chilian Clover (from our own seed) in immediate foreground.

GRASSES AND CLOVERS UNDER IRRIGATION AT YANCO EXPERIMENT FARM.

Melilotus alba.—This variety, better known as Bokhara or Sweet clover, is a soft, succulent, upright-growing variety, having a large amount of dark green trifoliate leaves, extending almost to the ground. The foliage has a peculiar sweet smell, from which the variety probably received its second popular name. It bears a marked resemblance to young lucerne, but differs from it in taste, having a bitter juice which makes it disliked by stock. The root growth is good, thick succulent-looking roots extending deeply into the ground and through the clay bands. After the seed germinated, growth was rather slow, but the plants stooled well, and eventually reached a height of about 2 feet. After this was cut a further growth was made, which was thicker than the former, but not so high. During last winter and the present spring an excellent growth was made of foliage free from coarseness, which reached nearly 4 feet in height. So far the plants have not flowered, but judging by appearances will do so shortly.

The above is the American type. There is also another—the Australian type—which grows taller and coarser, and carries less foliage. In other respects it is similar to the former.

Probably the only use this clover could be put to would be the renovating of worn-out lands. For its deep-rooting habits and the large quantity of foliage it produces, it should be useful in this respect. The fact that it is a legume should also further recommend it for this purpose. Best results would probably be obtained (especially from root-action) were the crop to be grown for at least two years before being turned under, thus allowing the roots to penetrate to a greater depth.

The Medics (*Medicago tuberculata, M. hispida, M. hispida sardoa,* and *M. hispida reticulata*).—The members of this family have again made good growth. They have quite a different habit from the ordinary clover, being more branched and vine-like, trailing over the ground in all directions, and yielding large quantities of green succulent fodder. Commencing to grow about March or April, they remain green well into December in good seasons, and yield a large quantity of burrless pods, which propagate the following autumn. In comparison with the Burr Trefoil (large quantities of which are growing on our natural pastures) they have great advantages. Where the Burr Trefoil, owing to its spiked seed-pod becoming entangled in the wool, has a damaging effect upon the fleece, as well as causing much inconvenience during shearing, the Medics, being without the burrs, are practically harmless. They also supply a greater quantity of green fodder for a longer period, and seed profusely. For the above reasons they can be recommended as worthy of further trial on a larger scale. Very little difference is noticeable in the four varieties mentioned. *Medicago hispida confinis* and *M. hispida sardoa,* perhaps, carry more leaf and remain greener for a longer period than the other two.

Other clovers previously mentioned, and which again did well, are the Egyptian, Red, and Crimson varieties.

Varieties of Wheat and other Cereals.

RECOMMENDATIONS BY THE DEPARTMENT OF AGRICULTURE.

A CONFERENCE of departmental officers was held in Sydney on the 17th and 18th January, 1917, for the purpose of revising the list of varieties of wheat and other cereals recommended by the Department for cultivation, and of discussing other matters connected with the growing of cereals.

There were present:—Messrs. G. Valder, Under Secretary and Director of Agriculture; H. Ross, Chief Inspector; G. M. McKeown, Manager of Wagga Experiment Farm; R. W. Peacock, Manager of Bathurst Experiment Farm; F. G. Chomley, Manager of Yanco Experiment Farm; M. H. Reynolds, Manager of Cowra Experiment Farm; A. H. E. McDonald, Manager of Coonamble Experiment Farm; A. H. MacDougall, Manager of Temora Demonstration Farm; H. J. Kelly, Manager of Nyngan Demonstration Farm; R. H. Gennys, Manager of Glen Innes Experiment Farm; W. R. Colwell, Manager of Trangie Demonstration Farm; J. T. Pridham, Plant Breeder; H. C. Stening, R. W. McDiarmid, and R. G. May, Inspectors of Agriculture; and J. N. Whittet, Instructor in Agriculture, representing the Hawkesbury Agricultural College. In addition, Mr. F. B. Guthrie, Chemist, and Mr. G. W. Norris, of the Chemist's Branch, were present during portion of the proceedings.

Classification of Wheat Districts.

The classification of the wheat districts of the State has been modified to include the Black Soil Plains, and is now as follows:—

1. Coastal (embracing those districts bordering on the coast, and which are specially subject to rust).
2. Northern Tableland (of which Glen Innes Farm is representative).
3. Central Tableland (of which Bathurst Farm is representative).
4. South-western Slopes and Riverina (of which Wagga and Temora Farms are representative).
5. Central-western Slopes (of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative).
6. North-western Slopes (of which Tamworth and Gunnedah are representative).
7. Black Soil Plains (of which Coonamble Farm is representative).
8. Western Plains (of which Nyngan and Condobolin Farms are representative).

Classification of Varieties of Wheat.

The following is a convenient classification of varieties of wheat, in respect of maturity, from a State standpoint. Obviously, there will be slight differences in various districts. The seasons for sowing are printed in heavier type, but readers are recommended to refer to subsequent tables for their respective districts:—

Very Early.—Sunset, Bunyip, Florence, Firbank.

Early.—Canberra, Comeback, Thew, Improved Steinwedel.

(These should usually be sown late.)

Mid-season.—Hard Federation, Warren, Bomen, Federation.

(These should usually be sown in mid-season.)

Late.—Marshall's No. 3, Yandilla King, Rymer, Zealand, Cleveland, Huguenot.

Very Late.—Haynes' Blue-stem.

(These should usually be sown early.)

Varieties Recommended.

It was decided that the following varieties of wheat should be recommended for cultivation:—

A.—DUAL-PURPOSE WHEATS.

Recommended for both Grain and Hay.

Variety.	Period of Sowing.	Districts.
Bomen	Mid-season	Central-western Slopes; South-western Slopes and Riverina; North-western Slopes.
Cleveland	Early	Cooler portions of South-western Slopes and Riverina.
	Early and mid-season ...	Central Tableland; cooler portions of North-western and Central-western Slopes.
Comeback	Mid-season and late	Central-western Slopes; North-western Slopes.
	Late	South-western Slopes and Riverina.
Firbank	Mid-season and late	Central-western Slopes.
Florence	Mid-season and late	Central-western Slopes; South-western Slopes and Riverina; North-western Slopes; Central Tableland; Northern Tableland; Black Soil Plains; Western Plains.
Haynes' Blue-stem.	Very early	Northern Tableland.
Improved Steinweidel.	Mid-season	Drier portions of South-western Slopes and Riverina; Central-western Slopes; North-western Slopes; Black Soil Plains; Western Plains.
Marshall's No. 3 ...	Early	South-western Slopes and Riverina.
	Early and mid-season ...	Central Tableland; Central-western Slopes; North-western Slopes.
Rymer	Early mid-season	Central-western Slopes; North-western Slopes.
	Mid-season	Central Tableland.
Warren	Early	Black Soil Plains.
	Early and mid-season ...	Coastal.
	Mid-season	Central-western Slopes; North-western Slopes.
Yandilla King ...	Early	South-western Slopes and Riverina.
	Early and mid-season ...	Central Tableland; North-western Slopes; Central-western Slopes.

B.—WHEATS FOR GRAIN ONLY.

Not recommended for Hay.

Variety.	Period of Sowing.	Districts.
Bunyip	Mid-season and late	South-western Slopes and Riverina; Central-western Slopes.
	Late	North-western Slopes.
Canberra	Late	South-western Slopes and Riverina; Central-western Slopes; North-western Slopes.
Federation	Mid-season	Central Tableland; South-western Slopes and Riverina; Central-western Slopes; North-western Slopes.
Hard Federation	Mid-season and late	Central Tableland; Central-western Slopes; North-western Slopes.

C.—WHEATS FOR HAY ONLY.

Not recommended for Grain.

Variety.	Period of Sowing.	Districts.
Firbank	Mid-season and late	South-western Slopes and Riverina; North-western Slopes; Western Plains.
Huguenot	Early and mid-season	Coastal.
Thew	Mid-season and late	Coastal.
Zealand	Early	Central Tableland; South-western Slopes and Riverina; Central-western Slopes.

D.—WHEATS SUITABLE FOR GREEN FEED.

Variety.	Period of Sowing.	Districts.
Huguenot	Early and mid-season	Coastal.
Thew	Early, mid-season, and late	Coastal; Northern Tableland; North-western Slopes.
Florence	Early, mid-season, and late	Coastal.

E.—WHEATS FOR FURTHER TRIAL.

The following varieties were selected as being suitable for continued experiment at the Experiment Farms and in the Farmers' Experiment Plots :—

Variety.	Period of Sowing.	Districts.
Sunset	**Late**	**Black Soil Plains ; Western Plains.**
Genoa	**Early and mid-season** ...	**Northern Tableland ; North-western Slopes.**
Currawa	**Early**	**South-western Slopes and Riverina.**
	Early and mid-season ...	Central Tableland ; Central-western Slopes ; North-western Slopes.
Major	Early	South-western Slopes and Riverina; North-western Slopes.
	Early and mid-season ...	Central-western Slopes.
Warden	Early	South-western Slopes and Riverina ; Central-western Slopes ; North-western Slopes.
King's Red ...	Mid-season	Black Soil Plains ; Western Plains.
	Mid-season and late	South-western Slopes and Riverina; Central-western Slopes ; North-western Slopes.
King's White ...	Mid-season	Black Soil Plains ; Western Plains.
	Mid-season and late	South-western Slopes and Riverina; Central-western Slopes; North-western Slopes.
Roseworthy ...	Early and mid-season ...	Central Tableland ; South-west rn Slopes and Riverina ; Central-western Slopes ; North-western Slopes.
Hard Federation ...	Mid-season and late	South-western Slopes and Riverina
Clarendon (formerly known as Hawkesbury No. 3.)	Mid-season and late	All districts.

F.—WHEATS TO BE GROWN UNDER IRRIGATION.

In experiments carried out by the Department, the following wheats have given the best results when grown under irrigation for hay and green fodder :—

(1) Zealand. (2) Marshall's No. 3. (3) Florence (late sowing).

These experiments are being continued in several districts.

Wheats for Districts.

The wheats recommended by the Department for various purposes may be grouped in districts as follows :—

1. COASTAL DISTRICTS.

[Embracing those districts bordering on the coast and specially subject to rust.]

For Grain or Hay—

Warren (early and mid-season sowing).

For Hay only—

Huguenot (early and mid-season sowing) ;
Thew (mid-season and late sowing).

COASTAL DISTRICTS—*continued.*

For Green Fodder—

Huguenot (early and mid-season sowing);
Thew (early, mid-season, and late sowing);
Florence (early, mid-season, and late sowing).

2. NORTHERN TABLELAND.

[Of which Glen Innes Farm is representative.]

For Grain or Hay—

Haynes' Blue-stem (very early sowing);
Florence (mid-season and late sowing).

For Green Fodder—

Thew (early, mid-season, and late sowing).

3. CENTRAL TABLELAND.

[Of which Bathurst Farm is representative.]

For Grain or Hay—

Marshall's No. 3 (early and mid-season sowing);
Cleveland (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Rymer (mid-season sowing);
Florence (mid-season and late sowing).

For Grain only—

Federation (mid-season sowing);
Hard Federation (mid-season and late sowing).

For Hay only—

Zealand (early sowing).

4. SOUTH-WESTERN SLOPES AND RIVERINA.

[Of which Wagga and Temora Farms are representative.]

For Grain or Hay—

Yandilla King (early sowing);
Marshall's No. 3 (early sowing);
Bomen (mid-season sowing);
Improved Steinwedel (mid-season sowing), in drier portions only;
Florence (mid-season and late sowing);
Comeback (late sowing).

N.B.—Cleveland (early sowing) is specially suitable for cooler portions of this district, such as Harden and Holbrook.

For Grain only—

Federation (mid-season sowing);
Bunyip (mid-season and late sowing);
Canberra (late sowing).

For Hay only—

Zealand (early sowing);
Firbank (mid-season and late sowing).

5. CENTRAL-WESTERN SLOPES.

[Of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.]

For Grain or Hay—

Marshall's No. 3 (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Rymer (early mid-season sowing);
Bomen (mid-season sowing);
Warren (mid-season sowing);
Improved Steinwedel (mid-season sowing);
Comeback (mid-season and late sowing);
Florence (mid-season and late sowing);
Firbank (mid-season and late sowing).

N.B.—Cleveland (early and mid-season sowing) is specially suitable for the cooler portions of this district, such as Mudgee.

For Grain only—

Federation (mid-season sowing);
Bunyip (mid-season and late sowing);
Hard Federation (mid-season and late sowing);
Canberra (late sowing).

For Hay only—

Zealand (early sowing).

6. NORTH-WESTERN SLOPES.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Yandilla King (early and mid-season sowing);
Marshall's No. 3 (early and mid-season sowing);
Rymer (early mid-season sowing);
Improved Steinwedel (mid-season sowing);
Bomen (mid-season sowing);
Warren (mid-season sowing);
Comeback (mid-season and late sowing);
Florence (mid-season and late sowing).

N.B.—Cleveland (early and mid-season sowing) is specially suitable for the cooler portions of this district, such as Inverell and Delungra.

For Grain only—

Federation (mid-season sowing);
Hard Federation (mid-season and late sowing);
Canberra (late sowing);
Bunyip (late sowing).

For Hay only—

Firbank (mid-season and late sowing).

For Green Fodder—

Thew (early, mid-season, and late sowing).

7. Black Soil Plains.

[Of which Coonamble Farm is representative.]

For Grain or Hay—

Warren (early sowing);
Improved Steinwedel (mid-season sowing);
Florence (mid-season and late sowing).

8. Western Plains.

[Of which Nyngan and Condobolin Farms are representative.]

For Grain or Hay—

Improved Steinwedel (mid-season sowing);
Florence (mid-season and late sowing).

For Hay only—

Firbank (mid-season and late sowing).

Classification of Wheat Varieties from a Milling Standpoint.

The wheats recommended in the foregoing list have been classified by Messrs. F. B. Guthrie and G. W. Norris, of the Chemist's Branch, as follows:—

New South Wales Strong White Wheats—

Comeback.

Medium Strong-Flour Wheats—

Bomen, Bunyip, Cleveland, Canberra, Federation, Firbank, Florence, Hard Federation, Haynes' Blue-stem, Marshall's No. 3, Rymer, Sunset, Thew, Yandilla King, Zealand.

Weak-Flour Wheats—

Improved Steinwedel, Warren.

Macaroni Wheat—

Huguenot.

VARIETIES OF OATS, BARLEY, AND RYE RECOMMENDED BY THE DEPARTMENT OF AGRICULTURE.

At the Departmental Wheat Conference, held on the 17th and 18th January, 1917, and attended by Managers of Experiment Farms and Inspectors of Agriculture, it was agreed to make the following recommendations:—

Oats.

Coastal.—Algerian, Ruakura.

Central Tableland.—Algerian, Guyra, Lachlan (formerly known as Cowra No. 18), Potato, Abundance.

Northern Tableland.—Algerian, White Tartarian, Potato, Guyra, Sunrise, Lachlan.

South-western Slopes and Riverina.—Algerian.

Central-western Slopes.—Algerian, Sunrise, Lachlan.

North-western Slopes.—Algerian, Sunrise.

Under Irrigation.—Abundance, Algerian, Ruakura, Sunrise.

Recommended for Further Trial on Experiment Farms and Farmers' Experiment Plots.—Sunrise (for Western Plains), Brown Calcutta.

BARLEY.

The following were considered good varieties of barley:—

FEED BARLEYS.—*Skinless.*—For green winter feed and grain for stock in districts with comparatively mild winters.

Cape.—For green fodder and grain for stock in the cooler districts.

MALTING BARLEYS.—*Standwell* has proved best at Bathurst Experiment Farm, and *Maltster* has given good results; but at Wagga Experiment Farm the best varieties have proved to be *Kinver, Golden Grain,* and *Goldthorpe*, in the order named.

Recommended for Further Trial on Experiment Farms and Farmers' Experiment Plots.—Feed: *Chilian, Abed July*; Malting: *Abed Binder.*

RYE.

Black Winter. }
White } For early winter fodder and grain, also for collar-making.

It was pointed out that ryes are suitable for cultivation on poor soils, generally in cold districts, for green feed and green manuring. They are hardly suitable for grain at any time, as the yield is small.

THE DAIRY INDUSTRY ACT, 1915.

BRANDS FOR DAIRY BUTTER.

THE attention of dairy farmers is invited to the fact that butter put up for sale should have the name and address of the maker on the outside of the wrapper. The following is a specimen of what is required:—

> **PURE BUTTER.**
>
> ---
>
> **Made by JAMES SMITH,**
>
> **ASCOT, WAGGA.**
>
> **Registered Dairy Industry Act.**

Such stamps may be obtained from any firm who supply rubber stamps generally, the estimated cost being:—

1 stamp, cushioned, 3 inch x 2 inch, about 4s. 6d.
1 bottle meat branding ink, 1s. 6d.
1 dry pad, 1s.

Proportion of Grain to Sheaf as a Factor in Wheat Selection.

J. T. PRIDHAM, Plant Breeder.

ALTHOUGH it has been found by the Swedish investigators at Svalöf that correlations in the morphological characters in the wheat plant cannot be relied upon to indicate qualities useful to the farmer, there are certain physical correlations which usually obtain, such as extreme earliness and weakness of straw; high grain quality and moderate yielding power. It would be useful to the plant breeder to know whether a high proportion of grain to sheaf is generally associated with high grain yield per acre.

The proportion of grain to sheaf was determined for a large number of varieties in 1914 and 1915 at Cowra, and this has been compared with the yields of grain in the tables given below. In each year the plots of each variety were sown in three separate locations, but in 1914 there were three plots, and in 1915 nine plots of each wheat. The plots were 20 feet long, about forty-two plants being harvested from each. At harvest time they were cut at a uniform height from the ground, representing the work of a reaper and binder machine. The sheaves were fastened to stakes, and weighed when dry. They were then threshed, and the weights of grain taken. The proportion of grain to sheaf was found by dividing the grain yield by the weight of the dry sheaf.

It was noted that a few high yielders of grain suffered from weakness of straw.

Year.	Average Yield per Plot.	Grain.	Proportion of Grain to Sheaf.	Rainfall, April to October inclusive.
		lb. oz.		
1914	21 varieties yielding above the average...	2 4	·39	868 points.
	15 varieties yielding below the average ...	1 9½	·36	
	Difference	0 10½	·03	
		lb. oz.		
1915	30 varieties yielding above the average ...	3 6½	·318	1,572 points.
	25 varieties yielding below the average ...	2 10½	·260	
	Difference	0 12	·058	

The results seem to show that there is a rather higher proportion of grain to sheaf with the heavier yielding varieties, but that the proportion varies with the season. Myers* quotes the results of experiments in Kentucky, Ontario, and Pennsylvania, which go to show that the production of grain and straw increase together. His own experiments in the same report dealing with individual plants also support this conclusion. If, as he points out, the gross weight of the plant (straw and grain) can be taken as an indication of the weight of the grain, harvesting operations would be considerably lightened for the plant breeder; the threshing and weighing of grain samples could be greatly curtailed.

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* American Breeders' Association Annual Report, Vols. VII and VIII, p. 70.

Two strains, "A" and "B," of the crossbred Yandilla King x Zaff in its sixth generation were harvested plant by plant in 1914, with the object of securing a wheat with a high proportion of grain to sheaf. "A" strain appeared to be fixed, and the yields when plotted gave a true frequency curve; "B" strain, however, appeared to consist of more than one strain, and to be a more promising subject for selection for the desired quality. In 1915, grain from one plant, "Q," was sown to represent "A" strain, and from two plants, "D" and "E," representing "B" strain. "Q" reproduced the uniform results of the parent in 1914, but "D" and "E" would seem to include in each case two strains, the one yielding a higher proportion of grain to sheaf than the other. But it will be seen that the few highest yielding plants on the right-hand side of the tables, on the average, have a medium to low proportion of grain to straw. Consequently, it seems unwise to pursue the selection for this quality further, except as of quite secondary importance to that of yielding power. While high grain yields are not associated with a very high proportion of straw, it is equally true that they are not correlated with a very low proportion. A heavy yielding wheat for a farmer's main crop requires sufficient stalk and leaf for its vigorous development; and the surest method for the breeder would be to select the heaviest yielding plants for sowing, provided that they do not fall short appreciably in other desirable qualities. The results above quoted seem to indicate that as between plants of the same variety the gross yield is sufficient to determine the most productive plants for grain; but more data are required to confirm this conclusion.

(Yandilla King x Zaff)^6—"A" strain, Cowra, 1914.

Proportion of Grain to Sheaf.	Yields of Grain (grammes).										Totals.
	4–7	7–10	10–13	13–16	16–19	19–22	22–25	25–28	28–31	31–34	
·425–·450	...	...	1	...	...	...	...	...	...	...	1
·450–·475	...	...	...	...	...	...	...	...	...	...	0
·475–·500	...	...	...	...	...	...	1	...	...	...	1
·500–·525	1	1	3	2	...	...	...	...	...	...	7
·525–·550	...	2	5	3	...	...	...	...	...	...	10
·550–·575	4	11	13	8	5	1	2	0	1	...	45
·575–·600	1	6	1	8	3	...	...	..	...	...	19
·600–·625	...	4	12	6	...	...	...	...	...	1	23
·625–·650	3	2	2	...	...	...	...	...	...	...	7
·650–·675	...	4	1	...	...	...	...	...	...	...	5
·675–·700	...	1	...	...	...	...	...	...	...	...	1
Totals...	9	31	38	27	8	1	3	0	1	1	119

(Yandilla King x Zaff)^{6}—"Q" strain, Cowra, 1915.

Proportion of Grain to Sheaf.	Yields of Grain (grammes).												Totals.
	7-10	10-13	13-16	16-19	19-22	22-25	25-28	28-31	31-34	34-37	37-40	40-43	
·375-·400	...	...	1	...	...	...	...	...	..	...	...	...	1
·400-·425	...	...	...	...	...	...	...	...	...	...	...	...	0
·425-·450	1	...	2	1	1	...	1	2	...	...	...	1	9
·450-·475	...	..	3	...	2	6	7	1	2	..	...	1	22
·475-·500	...	...	...	1	11	17	8	6	2	1	...	...	46
·500-·525	1	2	3	14	9	18	6	3	2	1	...	1	60
·525-·550	1	...	5	9	5	2	...	1	...	...	...	...	23
·550-·575	1	2	4	2	4	...	...	...	...	...	...	...	13
·575-·600	...	1	...	...	...	...	...	...	...	...	...	...	1
·600-·625	1	1	...	...	...	...	...	...	...	...	..	...	2
·625-·650	1	...	...	...	...	...	...	...	...	...	...	...	1
Totals...	6	6	18	27	32	43	22	13	6	2	0	3	178

(Yandilla King x Zaff)^{6}—Grain Yield, "B" strain, Cowra, 1914.

Proportion of Grain to Sheaf.	Yields of Grain (grammes).									Totals.
	5-8	8-11	11-14	14-17	17-20	20-23	23-26	26-29	29-32	
·400-·425	...	1	...	...	...	...	...	...	...	1
·425-·450	...	..	1	...	...	...	...	...	...	1
·450-·475	...	2	...	...	...	...	...	...	...	2
·475-·500	...	...	1	...	...	...	...	...	...	1
·500-·525	...	...	3	1	3	...	...	...	1	8
·525-·550	3	4	4	2	1	...	...	...	...	14
·550-·575	2	1	8	8	2	2	...	...	...	23
·575-·600	2	1	3	5	2	...	1	...	...	14
·600-·625	5	9	15	1	...	...	...	...	...	30
·625-·650	3	7	3	1	...	...	...	...	...	14
·650-·675	3	1	...	1	...	...	...	...	...	5
·675-·700	...	...	...	...	...	...	...	...	...	0
·700-·725	1	...	...	...	...	...	...	...	..	1
·725-·750	1	...	...	...	...	...	..	...	...	1
Totals	20	26	38	19	1	2	1	0	1	115

(Yandilla King x Zaff)—"E" strain, Cowra, 1915.

Proportion of Grain to Sheaf.	Yields of Grain (grammes)													Totals.
	5-8	8-11	11-14	14-17	17-20	20-23	23-26	26-29	29-32	32-35	35-38	38-41	41-44	
·400-·425	...	...	...	1	1	...	...	...	...	...	...	...	...	2
·425-·450	...	...	...	1	...	...	...	..	...	...	...	...	...	1
·450-·475	...	...	...	1	1	1	1	...	...	...	...	...	...	4
·475-·500	...	...	1	1	6	8	...	3	4	2	2	...	...	27
·500-·525	1	...	5	7	13	14	15	5	2	...	1	...	1	64
·525-·550	...	...	9	12	23	7	15	2	5	...	...	...	...	73
·550-·575	2	3	3	7	9	9	2	1	1	...	1	...	..	38
·575-·600	...	2	5	4	1	1	...	...	..	...	...	...	...	13
·600-·625	1	5	7	2	...	1	...	...	...	...	...	...	...	16
·625-·650	2	6	...	...	...	...	..	...	...	...	...	...	...	8
·650-·675	2	1	...	...	...	...	...	...	...	...	...	...	...	3
·675-·700	...	1	...	...	...	...	...	...	...	...	...	...	...	1
·700-·725	2	...	...	...	...	...	...	...	...	...	...	...	...	2
Totals	10	18	30	36	54	41	33	11	12	2	4	0	1	252

(Yandilla King x Zaff)^{7}—"D" strain, Cowra, 1915.

Proportion of Grain to Sheaf.	Yields of Grain (grammes).																Totals.
	6–9	9–12	12–15	15–18	18–21	21–24	24–27	27–30	30–33	33–36	36–39	39–42	42–45	45–48	48–51	51–54	
·325–·350 ...	...	...	1	..	...	...	...	...	...	...	...	...	...	...	...	...	1
·350–·375 ...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	0
·375–·400 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0
·400–·425 ...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
·425–·450 ...	...	...	...	...	...	1	1	2	...	...	...	...	1	...	...	...	5
·450–·475 ...	...	...	...	1	1	2	2	2	...	1	...	...	...	...	...	...	9
·475–·500 ...	...	...	...	...	1	4	5	3	3	2	...	1	...	...	1	1	21
·500–·525 ...	...	2	3	9	6	10	10	5	5	3	1	1	1	...	...	...	56
·525–·550 ...	...	5	1	6	7	1	4	2	...	...	...	...	...	...	...	...	26
·550–·575 ..	...	4	8	2	2	2	1	...	...	...	...	...	...	...	...	...	19
·575–·600 ...	2	2	3	...	...	..	...	...	...	...	...	...	...	...	...	...	7
·600–·625 ...	4	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	8
·625–·650 ...	5	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
·650–·675 ...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
·675–·700 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	0
·700–·725 ...	2	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	2
·725–·750 ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Totals ...	16	18	17	18	17	20	23	14	8	6	1	2	2	0	1	1	164

PLASTERING A PISÉ OR MUD BRICK HOUSE.

A CORRESPONDENT recently asked for some directions as to the best method of plastering a "mud" brick house, one portion of which was exposed to the weather.

The Works Overseer of the Department (Mr. A. Brooks) supplied the following:—

If the Pisé has not been strengthened by mixing in straw with it before it was put into the walls or made into bricks, it should have been well scratched diagonally both ways on the faces to form a key or grip for the plastering coat. A rake head does this work very well, but plasterers make a scratcher with a few pieces of lath, each pointed and spaced about 1½ inch apart. This is of course done while the stuff is green. The first coat for plaster, either inside or outside, should be of lime mortar, mixed with cow hair, as plasterers use for the first coat of lath work or ceilings, commonly called the pricking-up coat. This is also well scratched when put on, to form the key for the second coat.

The second coat for inside may be of lime and sand mortar and mixed with 1 part cement to, say, 20 parts of the lime mortar. This will make the floating coat, and should be covered with a putty lime coat of liquid lime run through a fine sieve and mixed with very fine sand. This coat may be tinted in colours as desired, using such as blue black, Venetian red, or yellow ochre in dry colours.

For the outside the second coat should be cement mortar only, gauged of 3 parts sand and 1 part cement, and put on about ⅝ inch thick. When put on the face may be lined out to imitate stone blocks 24 in. x 12 in. deep, and when dry, the walls may be coloured with lime wash, of a light straw colour, the lines blackened out with a carpenter's pencil.

If the walls are dried out before the plastering is put on, they must be well wetted before applying the plaster.

Fruit-drying.

PLANT AND EQUIPMENT.

W. J. ALLEN.

THE plant required for drying fruit differs somewhat with the extent of the operations, and in minor details it also differs with the class of fruit to be dealt with. In the main, however, the operation is much the same under all conditions, and it is convenient therefore in dealing with plant and equipment to refer at the same time to the reasons for the different operations, and the most efficient methods of carrying them out.

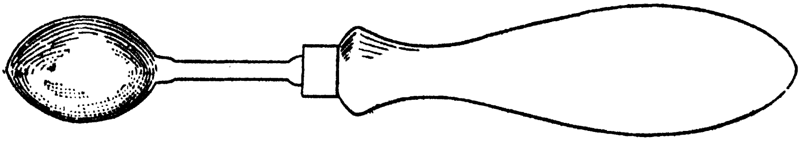
Packing dried fruits at Wagga Orchard.

The first essential, of course, is some kind of shed in which the fruit can be handled during the various stages of curing. It is usually found that an open shed with an earth floor is sufficient, all that is required being shade from the sun and shelter from showers. A wood and iron shed without walls is all that quite a number of orchardists use, and really all that is necessary. Some growers have contented themselves with large tents or canvas coverings. The floor should be of a kind that will not easily break up, for that has the objection that dust may be raised by wind—even by the movements of the operators—and then deposited on the fruit. The stones or pits that are removed from stone fruit are often made use of for this purpose, it being found that they bind well together and form a firm, dust-free floor. Even the best made floor, however, must be occasionally sprinkled to keep the dust down.

The size of the shed will vary a good deal with the quantity of the fruit to be processed, and with the resources of the grower. A dozen pitters can handle a good big crop under an open shed, covering 15 ft. x 20 ft.

Benches, the height of ordinary tables, are required to carry the fruit while it is being handled in its fresh condition, and also at various subsequent stages.

Where drying is merely a side-line to the production of dessert and cooking fruit, a portion of the packing shed may be devoted to the drying plant, the exact size and arrangements depending upon the quantity of fruit that is likely to be handled. There again all that is required is a bench on which the fruit can be pitted before being processed, and subsequently packed from the trays into boxes or cases.



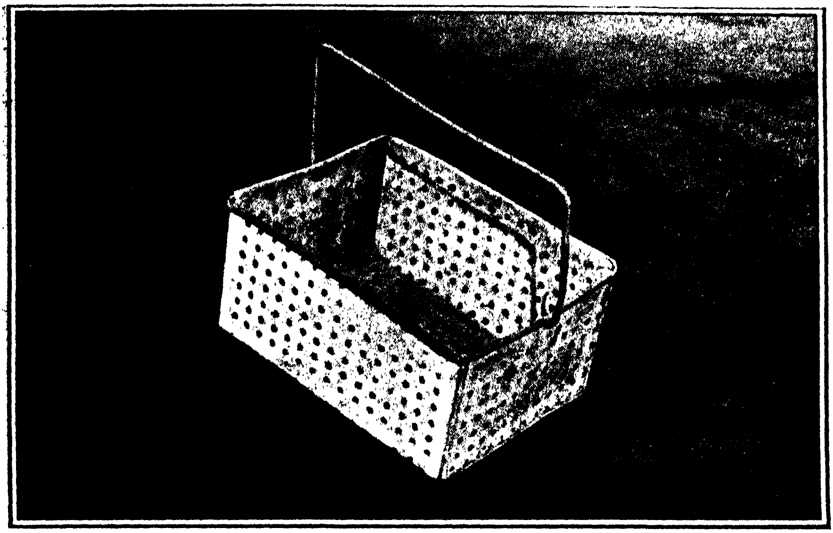
Spoon for removing pits from Clingstone Peaches.

Harvesting the Fruit.

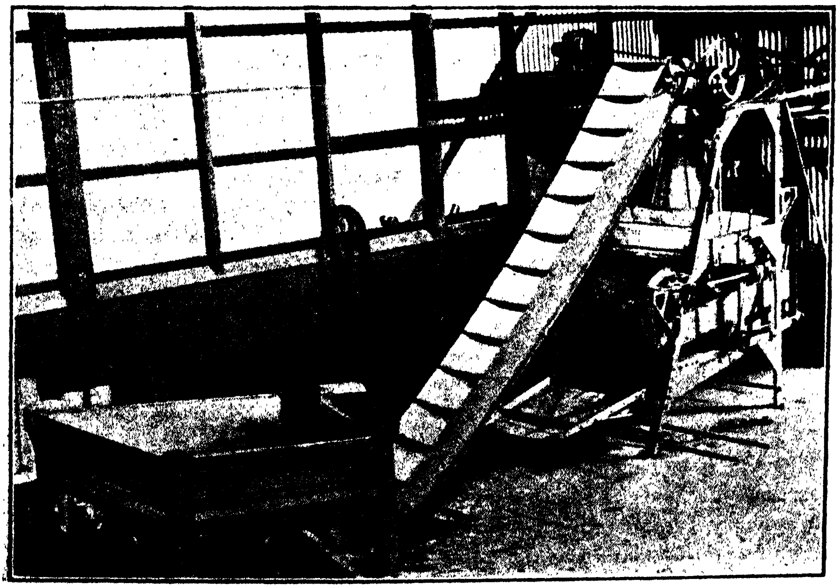
Where the quantity of fruit to be dealt with is large, it will be found more economical to shake the fruit from the trees into large sheets instead of picking it. Most New South Wales growers no doubt find it more satisfactory to pick by hand into cases or boxes suitable for holding the fruit during collection and transit to the shed, but the sheets will certainly pay in all cases where upwards of, say, a few tons of fruit has to be dealt with. With a staff sufficient to handle the crop rapidly, the bruising caused by the shaking off and pouring into boxes does little or no harm, the fruit being transferred to the fumigator before the bruised portions have had time to discolour.

Cases in which fresh fruit, such as prunes, apricots, apples, &c., can be carried from the orchard to the shed are necessary. These should have a capacity of about a bushel, and should be strongly made, so as to stand rough handling.

Certain tools and machines are essential to particular fruits. For cutting such fruits as peaches and apricots in halves (where they are not to be dried whole) sharp knives are necessary. The most suitable is that to be seen in the illustration on page 17 of last month's *Gazette*; it resembles that used by shoemakers, but the blade should be somewhat shorter. A pitting-spoon for removing the stones from clingstone peaches is also necessary. Where apples are to be handled, a peeler and corer will be required.; two different styles of machines were illustrated on pages 23 and 24 of last issue. The viticulturist who packs his own product will need, for the proper treatment of the currants, sultanas, lexias, &c., a grader and stemmer of the kind illustrated on page 97.



Dipping Basket.



Stemmer and Grader used for Dried Grapes at Yanco Experiment Farm.

Standing on the left side is the hopper into which the dried fruit is dumped in order to be fed on to the elevator.

FRUIT-DRYING ; PLANT AND EQUIPMENT.

The Dipping Bath.

A small tank, or bath, or boiler, is required to contain a caustic-soda solution for certain fruits—like prunes—the skins of which are to be slightly cracked in order to hasten the drying process by allowing the moisture to escape more rapidly. This bath is usually placed outside or in an open shed. The temperature of the solution has to be held within somewhat narrow limits—indeed, constantly boiling or very nearly so—and the bath must therefore be large enough to hold so much solution that the dipping of cool fruit will not readily reduce the temperature. To accommodate the class of dipping basket usually used, a tank made of tinned or galvanized iron 2 ft. 6 in. x 3 ft. 6 in. and 24 in. deep is convenient. Where operations are on a large scale it has been found convenient to have two baths—one to be heating while the other is in use. A board on which the baskets can be deposited when lifted out of the solution might be placed alongside in such a position that the solution will run back into the tank as it drains from the fruit. Sometimes the tank is set in bricks so that a fire can be kept burning underneath; a portable boiler of suitable size can also be used.

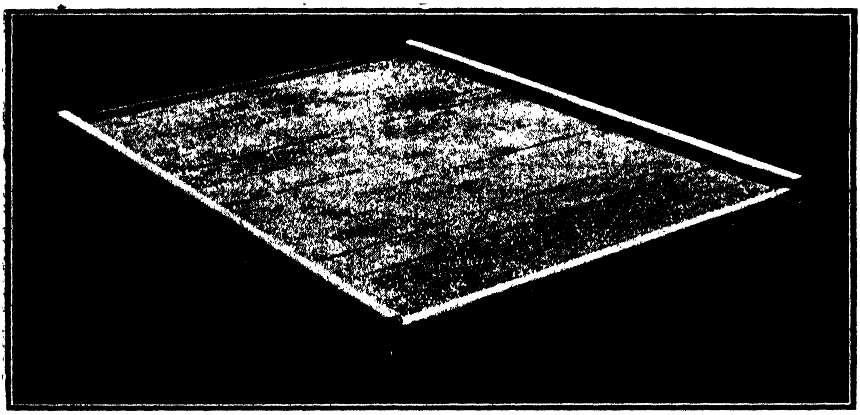
Types of Dipping Baskets.

The baskets used for containing the fruit during the dipping are of various types. The commonest of all, perhaps, is a kerosene tin cut down to about half the depth, and freely perforated with holes on the sides and bottom. If this basket is made on the farm, the holes should be punched from the inside, otherwise the jagged edges made by the punch will catch and hold the fruit, delaying matters every time it has to be emptied. For safety and convenience the jagged edges should be hammered flat, whether inside or out. The handle should be made to swing to one side or the other, and if it can be readily detached and used for another basket it may be a convenience. A more durable but certainly dearer class of basket used at Yanco Experiment Farm is illustrated on page 97. It consists of galvanized iron with holes $\frac{5}{16}$ of an inch across and $\frac{3}{4}$ inch apart, punched clean through and leaving a smooth surface on both sides; ends and corners double lap jointed; no rivets or solder. The handle is of No. 4 galvanized iron wire, fitted to drop over the sides and slip into holes that are strengthened with eyelets; wire of the same gauge round the top edge gives rigidity to the whole. A third class of bucket (not so widely used, however) is made of strong galvanized wire, $\frac{1}{4}$ inch mesh, bound with hoop-iron, and so constructed that it revolves within the handles, thus making it an easy matter to empty the fruit out after dipping. This basket is about 3 inches longer and 2 inches wider than the ordinary kerosene tin, but it is expensive. Most of the growers at Mildura and Renmark use the galvanized iron basket on page 97, though the rise in the price of metal now makes even that almost too dear.

A vat is necessary for holding brine in which apples can be immersed after they have been peeled and cored, waiting to be transferred to the fumigator.

Drying Trays.

During the process of fumigating and drying, the fruit is kept on wooden trays. These trays vary slightly in size, but practical experience has indicated one or two sizes as particularly convenient under ordinary conditions. In the case of the evaporator, of course, the size of the tray is dictated by the size and design of the drying chamber, but for sun-drying the 3 ft. x 2 ft. tray that once was widely used has fallen into disfavour, somewhat larger sizes having been found to involve less work and to be as convenient. Two useful sizes are figured on this and the succeeding pages. The smaller, 4 ft. x 3 ft., consists of twelve 4 in. x $\frac{5}{8}$ in. x 3 ft. boards, bound above and below with $1\frac{1}{4}$ in. x 1 in. straps that make the sides; at the ends are attached shallow edgings $\frac{3}{4}$ in. x $\frac{1}{2}$ in., above and below, the corners being scarfed together, as can be seen in the illustration; to further strengthen the tray, a cleat of $1\frac{1}{4}$ in. x $\frac{1}{2}$ in. is run from end to end on the under side. The 6 ft. x 3 ft. tray consists of eighteen 4 in. x $\frac{5}{8}$ in. x 3 ft. boards (together with a narrow strip about 1 in. wide, usually required to make up the full length), bound top and bottom on each side with $1\frac{1}{4}$ in. x 1 in. straps, the ends of which are scarfed to let in the end edgings of $\frac{3}{4}$ in. x $\frac{1}{2}$ in., as in the case of the shorter tray; a centre cleat of 5 ft. $10\frac{1}{2}$ in. x 2 in. x $\frac{1}{2}$ in. is attached to the under side to give strength to the whole. The timber usually used for these trays is Richmond River pine or spruce. The parts for these trays can be procured from the timber merchants in the cities; they are delivered in shooks, so that all the orchardist has to do is to put them together.



Drying Tray, 4 ft. x 3 ft.

Trays of these kinds can be handled with ease and give satisfactory results in the fumigator and on the drying ground. Their construction also allows them to be stacked one upon another, with a couple of empty ones on top to protect the fruit from rain or to allow of slow drying, as in the case of currants. One of the accompanying illustrations shows the trays stacked as they would be in the event of wet or foggy weather.

A hand-barrow, where trays have to be carried to and from the sheds, fumigator, dipping tank, drying ground, &c., is a convenience, but in up-to-date orchards, where considerable quantities of fruit are dried, trucks running on laid tracks carry the trays in all directions.

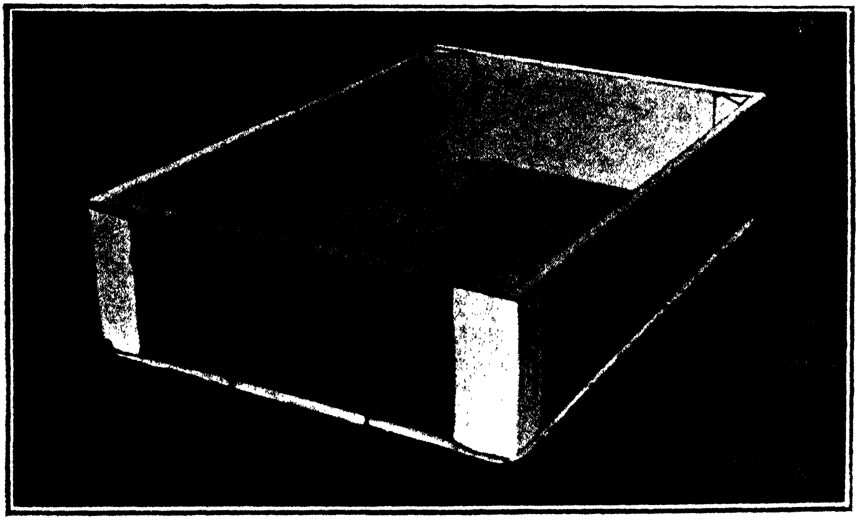
The Sulphur Room.

A room, or enclosure, in which the fruit can be subjected to the fumes of sulphur, for the purpose of setting the colour, is necessary. Peeled apples, for instance, quickly depreciate in appearance if exposed to the air, but "sulphuring" prevents the discoloration. The fumigator is usually built in the open, as sulphur fumes are distressing to some people. It should be large enough for reasonable requirements, and in any case should have a capacity for not less than 100 trays at one time, though much smaller quantities of fruit can be dealt with in an air-tight box such as could be inverted over, say, a small stack of trays. A room, 8 ft. x 13 ft. x 6 ft. 6 in. (interior measurements) would hold four stacks of the 6 ft. x 3 ft. trays described above, making approximately 150 trays, and would still allow for the free circulation of the sulphur fumes. About 2½ lb. of sulphur would be required for such a room. Where a large crop has to be dealt with, more than one or two such rooms will have to be provided. The material most suitable is tongued-and-grooved boards, put together with white lead, and puttied up at the corners and cracks, or papered on the inside. Fruit treated in a large room rarely tastes of the sulphur, which is a strong recommendation. Where only a very small quantity of fruit is being cured, a good sized packing-case can be papered on the inside and turned upside down over a stack of trays. Partly below the trays and partly extending outside the box, a hole, 2 feet 6 inches deep, should have been previously dug, and everything else being in position, the small iron pot containing the sulphur should be put under the trays, the match applied, and the hole covered in closely so that the fumes cannot escape.

Drying Tray, 6 ft. x 3 ft.

The Sweat Box and its Uses.

A sweat box is required, more particularly in the coastal districts, to correct any unevenness that may have occurred in drying. In the western districts as a rule, the fruit dries fairly evenly and sweating does not occur to any great extent. If, however, fruit that has not dried evenly is packed and stored in bulk it is liable to "sweat" or become moist, and discoloration and injury may result. To prevent this, the dried fruit is usually placed in a sweat box before being finally packed. In this sweat box it can be turned occasionally and the distribution of moisture is thus equalised, after which the fruit may be packed without fear of deterioration. But the use of the sweat box is not now confined to its original purpose, and it is employed just as extensively in the west as elsewhere, only for another reason. In most fruit-drying centres, factories have been established for the purpose of packing and marketing the dried product, and as a matter of fact, very little dried fruit is packed on the farm. Consequently the practice now very generally obtains of using the sweat boxes as receptacles in which the fruit may be stored, and in which it may be transferred to the factory when ready. There it is graded from the sweat boxes and packed into cases ready for market, the grower receiving his empty boxes on his next trip.



A Sweat Box of Substantial Make.

The box illustrated is specially designed for the purpose, and is in use at Yanco Experiment Farm. The side pieces are 3 ft. 3 in. long x 9 in. deep, and the end pieces 2 ft. 1 in. long x 9 in. deep. The bottom consists of three pieces 3 ft. 3 in. long x 9 in. wide, bound together by one cleat 2 ft. 2½ in. long x 4 in. wide. The sides, bottom, and bottom cleat are made of ⅝ inch timber, and the ends of 1 inch. As will be seen in the illustration there are four corner cleats, 9 inches long; these consist of 2 in. x 2 in. timber, which has been mitred, or cut in half from corner to corner so as to make a triangular shape.

The Drying Ground.

Where the sun is to be the sole or the principal drying agent, a drying ground must be provided, and it must be laid out in such a way that the fruit can be carried on trucks to any part of the ground, thus saving considerable handling. Some growers whose operations are on a large scale have laid light trolly lines so that the fruit can be delivered on the trays to any part of the ground. It is one of the essentials of the drying ground that it should be as free from dust as possible. In this respect a lucerne paddock is admirably adapted for the purpose, but the fruit dries more slowly than on dry soil.

Drying Ground at Wagga Experiment Farm.

Clean land that has not been broken up is very suitable, but where tramping to and fro may raise dust the paths and borders must be kept well sprinkled with water. Where stone fruit is being dried in this way, it is better not to leave tracks or paths between the trays, but to cover the whole of the ground, so that there are only the outside trays to watch. Trays containing raisins, however, must be arranged so that the fruit can be easily turned, and narrow paths must therefore be left between the rows of trays. If an evaporator forms part of the equipment the drying ground may be dispensed with altogether, or limited in area as desired.

Tents made of either calico or canvas are often used to protect trays of fruit from weather, as illustrated on the next page. Arrangements are made in this case which enable the orchardist to draw the covers along on wires, so that, in the event of rain or a cold and dewy night late in the season, several thousand trays can be covered within a few minutes.

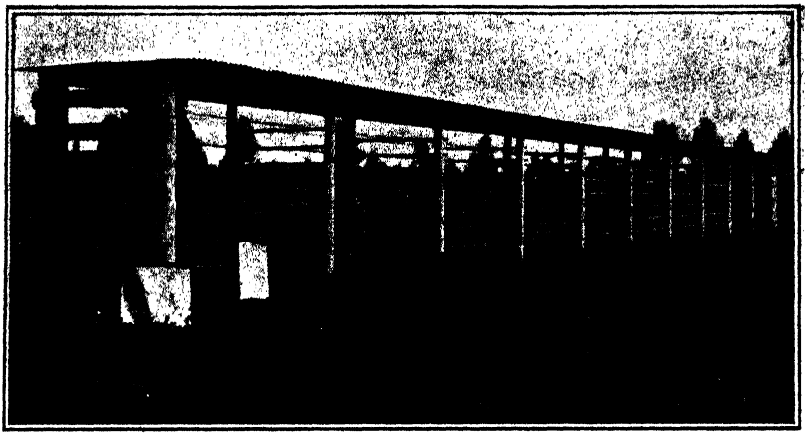
Trays 6 ft. x 3 ft. covered with Tents.

The tents are so placed that several thousand trays can be covered within a few minutes.

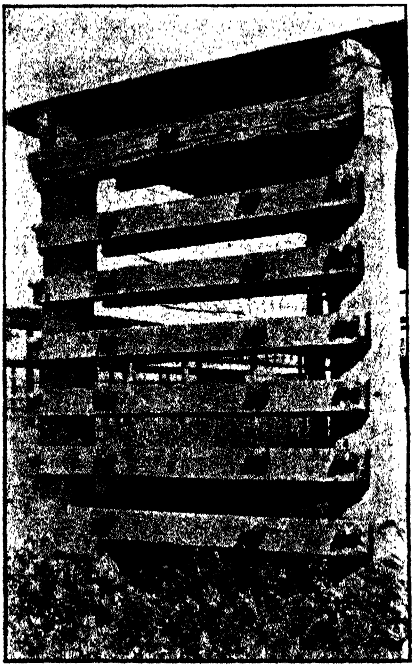
Racks for Curing Grapes.

Many growers whose operations are on a fairly large scale no longer dry their currants, sultanas, and lexias on trays but erect timber staging and stretch wire-netting from end to end to carry the fruit. The method is to erect a substantial hardwood staging, such as those shown in the accompanying illustrations. From five to seven layers of 2-inch mesh netting, 12 or 14 inches apart, are then stretched between the posts; some growers are trying layers only 6 inches apart. Several methods are employed for tightening the netting, some supporting it on longitudinal wires, others having wooden rollers at the ends, and others again providing a network of wood underneath so as to divide the netting into sections the size of trays. Hessian is spread on the ground beneath the racks; this serves to catch any fruit that may fall through the netting during the process of drying, and also allows the whole of the fruit, when dry, to be rubbed free from the stalks and to be caught before it reaches the ground. From the hessian it can be easily gathered into boxes or trays and removed to the packing house. Pine posts are generally used, and an iron roof affords protection against bad weather.

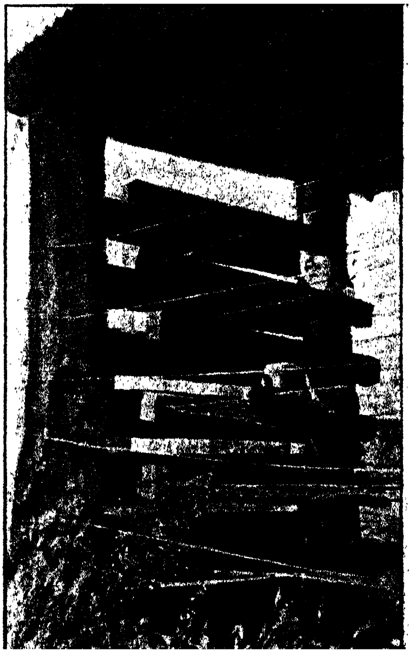
At Yanco Experiment Farm, the drying racks are 7 feet 6 inches in height and 90 feet in length. They comprise seven tiers, the first 12 inches from the ground and the top one 15 inches from the roof, the distance between each intermediate tier being 10½ inches. The main posts are necessarily substantial—12 inches in diameter and 11 feet 6 inches long—and they are sunk in the ground to a depth of 4 feet. They are well rammed and a chock is laid against the heel of the posts and another in front, well below the surface. Extra posts, either 4 in. x 4 in. square timber or round pine of a corresponding size, are placed at distances of 10 feet to strengthen the structure and support the weight of the fruit. Two beams, consisting of 5 in. x 2½ in. Oregon of good quality, are laid along the top of the posts—one on either side—to carry the roof.



Rack for Drying Grapes.
In use at Yanco Experiment Farm.



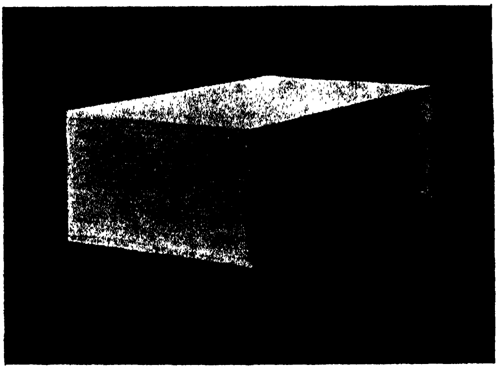
End View of Drying Racks.
Showing method of securing the Wires.



Another End View of Drying Rack.
Showing how the wire-netting is secured and supported.

FRUIT-DRYING.

Galvanized iron sheets 8 feet in length are used to form the roof, which must be perfectly flat. This latter is an important point, as with a sloping roof raindrops that fall from the roof are liable to be driven on to the fruit by the wind, whereas if the roof is flat the drops will be driven clear of the fruit. The wire-netting used is 4 ft. wide x 2 in. mesh x 16 gauge. It is fastened at the ends by being bolted between double hardwood battens 3 in. x 1½ in. x 4 ft. 2 in. wide. Two strong wires are attached to these battens, one close to each end, and the wires are run through the end pieces, which are composed of 5 in. x 3 in. hardwood, where it is attached to wire strainers by means of which it may be tightened at will. The netting is supported at intervals of 10 feet by battens resting on ⅝ inch iron pegs driven into the intermediate posts alluded to above. In order to regulate the rate of drying, provision is made to hang hessian curtains along the sides of the rack. For the purpose of putting the fruit on to the rack, a large flat iron tray, 2 ft. x 1 ft. 6 in., is used. When filled with fruit this tray is placed on the netting in the position that the fruit is intended to occupy, and then withdrawn by a sudden jerk which leaves the fruit on the wire.



Box of the class used for Packing Dried Fruits.

Such a rack as is illustrated costs about one-third of the amount required to purchase trays to hold the same quantity of fruit, and also effects a substantial saving in labour, inasmuch as there is neither stacking nor unstacking—a costly matter where there are large quantities to be handled. It is true that the fruit takes a little longer to dry in racks, but against this may be set a distinct improvement in the sample. Any grower who contemplates using racks for drying his fruit should make arrangements to have the construction of the racks well in hand before the picking season commences.

Packing for Market.

Dried fruit is usually packed in a fairly substantial and well-made class of case or box, a capacity for 56 lb. being the most common, except with prunes, which are generally put up in 28 lb. boxes. At Yanco Experiment Farm the inside measurements for the respective sizes are 22 in. long x 12 in. wide x

7 in. deep for the former, and 17½ in. x 9 in. x 6 in. for the latter. Dressed white pine of ⅝ in. thickness is used for the ends, and the same material of ⅜ in. thickness for the sides, tops, and bottoms. The tops and bottoms are in two pieces of equal width. The parts are received from the timber mill or merchant tied in shooks ready to be nailed together. Only timber of good quality and free from loose knots, shakes, and wanes, is used.

The first grade product of nearly all kinds of fruit is usually packed with the top layer faced up, the rest of the contents being put in and pressed. Facing up is sometimes done with table raisins, but dried grapes of other kinds are not usually so treated.

SUITABLE LOCALITIES IN NEW SOUTH WALES FOR BEE-FARMING.

A RETURNED soldier recently inquired for information as to a suitable locality in which he could start bee-farming.

The letter was referred to Mr. R. G. Warry, Agricultural Expert of the Department, who reported as follows:—

With the exception of the Peel River and Nundle district, the Hunter River valley, and Murrumbidgee Irrigation Area, where lucerne provides a good weight of honey, the bulk of the honey produced in New South Wales is obtained from flowering forest trees (hardwoods), and some brush timbers.

Bee-farming on the irrigation areas is a good subsidiary occupation; in good seasons, up to £2 per colony of bees can be realised, and unless other apiaries are in close proximity, an apiary of from fifty to sixty colonies could be run on the block.

On the whole, the North Coast and inland hardwood forests produce the best returns.

Bee-farming as the chief means of making a living must be carried on in this State by running more than one apiary. The usual practice is to work one apiary at home, and up to five or six others at varying distances from it. An average of seventy colonies can be worked at each apiary. This is most successfully carried out in the following localities west of the Dividing Range, on the Northern Tableland, in the Riverina, and in any well-timbered part of the North Coast:—Inverell, Coonabarabran, Dunedoo, Mudgee, Sofala, Wellington, Dubbo, Parkes, Forbes, and Condobolin. The main supply from each of these places would be produced by yellow box (*Eucalyptus meliodora*), stringybark (*E. eugenioides*), and forest red gum (*E. tereticornis*), several other eucalypts contributing.

In the Riverina, any parts well timbered with yellow box and Murray red gum (*E. rostrata*) will support payable apiaries. Yellow box, willow, forest red gum, and stringybark are the main sources of supply from Tenterfield to Drake. On the North and Central Coast the best timbers are ironbark (*E. crebra*), grey gum, blackbutt, and spotted gum, and in brushes the brush box.

Cotton Growing in Australia.

THE first of the following statements has been supplied by the Executive Committee of the Commonwealth Advisory Council of Science and Industry, and presents a general view of the prospects of the industry in the tropical and sub-tropical areas of the continent. Considerable attention has, however, been given by the Department to the possibilities of profitably producing cotton in our own State, but the brief summary of the results given under its separate heading will indicate that the prospects in this direction are exceedingly slight.

A very large area in the northern parts of Australia has a climate suitable for the growth of cotton, indeed it has been estimated by experts that this area is greater than that suitable for cotton in the United States, where at the present time two-thirds of the world's supply is produced.

That high-class cotton can be grown in Queensland was conclusively proved at the time of the American civil war, when, owing to the inducement offered by the high price of cotton, that State exported twenty-six million lb. of ginned cotton, worth £1,300,000. The industry was subsequently almost abandoned, but partially recovered on the establishment of a cotton mill at Ipswich, which however eventually had to close down.

The chief difficulty in the past which has prevented the successful establishment of the cotton industry has been the high cost of picking the cotton in Australia. This was due partly to inexperience, there being no skilled body of pickers familiar with the crop, hence the picking was slow. The high wages prevailing in Australia were, however, the chief factor. In this respect it has to be remembered that wages in the United States are steadily rising, whilst at the same time black labour is being displaced from the cotton fields. The disparity between the cost of production in Australia and the United States is thus tending to disappear.

Authorities in Queensland consider that the best way to overcome the labour difficulty is to encourage farmers to grow small crops, say 10 acres of cotton in addition to their other crops. It is calculated that a family of four persons could easily pick the cotton produced on this area without extra help.

It has also been suggested that if the Government intend to provide ready-made farms for settlers in Queensland after the war, cotton would be the best crop with which to start. It is estimated that a ready-made farm comprising 80 acres of land, with a substantial bungalow-house, &c., would cost for clearing, fencing, planting crop, and erecting house, from £125 to £250, according to the nature of the vegetation on the land to be cleared.

Cotton waste, a bye-product of the spinning mills, is one of the chief raw materials used in the present manufacture of cordite. As the result of an article by Mr. G. S. Hart, entitled "No cotton, no shells," published in the *Rockhampton Daily Record*, a meeting was held at Mount Morgan, presided over by the Mayor. This meeting resolved :—

> "That a Munitions Cotton League be now formed, to press forward the production of cotton in Australia, so that it may be available for the manufacture of munitions."

The meeting was widely advertised in Queensland papers, and the Department of Agriculture undertook to deliver free seed to the nearest railway station. The Queensland Government also guaranteed to purchase seed cotton at 1¾d. per lb. About 300 growers obtained seed and about 800 acres were planted. Unfortunately the season was unfavourable and some of the seed available was not of very good quality, nevertheless a considerable number of the crops gave high yields. The Queensland Department of Agriculture is importing enough of the best American cotton seed to plant an additional 1,000 acres next season.

Though the annual peace-time requirement of prepared cotton waste for the manufacture of cordite in Australia is only 60 tons, yet it is obviously of great importance that Australia should be self-contained in the matter of the production of munitions. In England the cotton-waste is specially treated in Government works and is supplied as a product of exceeding uniformity. Before Australian-grown cotton could be used for the manufacture of service cordite, it would have to undergo simi [illegible] reatment and the cordite produced would require to be submitted [illegible] tive tests, both in respect to its stability and its ballistics. S [illegible] to be satisfactory would extend over a number of years.

Arrangements are now being made for the experimental
a fairly large sample of cordite from Australian cotton. This
tested and it is hoped that the results will be satisfactory. The
ments for testing have been made by the Commonwealth Advisory C
of Science and Industry.

As already mentioned, the absence of experienced cotton pickers in Australia has been one of the causes hindering the development of the industry. The patriotic action of the Munitions Cotton League has had the effect of familiarising a considerable number of agriculturists in Queensland with the cultivation and picking of cotton.

The introduction of a mechanical cotton picker is the most hopeful method of overcoming the difficulty due to the high cost of labour. Many machines for this purpose have been patented, but none have come into use, in spite of the fact that the invention of a simple contrivance which would enable the cotton to be picked twice as fast would make a fortune for its inventor. It is stated that the United States Department of Agriculture has spent £50,000 in experimenting with cotton-picking machines, and one American firm spent £5,000, and at last gave up experimenting. Several machines have also been invented in Australia.

The American inventors have mostly produced machines which pick the cotton by means of a number of arms bearing spikes which pass over the plant. These, however, damage the plant and spoil much of the cotton which is not yet ripe, and unless a variety of cotton could be produced which ripened all its seed at once, they are not likely to prove satisfactory.

The machines invented in Australia are on the suction principle, familiar in the vacuum cleaner, and to allow them to achieve their best effect it would be necessary to grow a variety of cotton in which the valves of the cotton-bolls open wide so as to expose the cotton fully.

Australia is fortunate in that the only two cotton pests at present established in this country are rust and the boll-worm, a species of cut-worm. The cotton-worm, cotton stainer, and dreaded boll-weevil of the United States are unknown, and it is important that imported seed and raw cotton should undergo rigid inspection to prevent the chance introduction of these pests.

In a recent issue of the Texas *Cotton and Cotton Oil News*, it is stated: "If the boll-weevils destroy as much of this year's cotton as they did last year the remnant that escapes the weevil will not supply adequately the world's demand, even if the war should continue, and should the war cease this fall, the price of the staple would go sky-rocketing."

Though the latter result unfortunately does not now seem at all probable, enough has been said to show that the establishment of an Australian cotton industry is of great importance from the standpoint of national defence, and is likely to be profitable to the cotton-growers, and also to be of considerable economic value to the Commonwealth both by increasing the value of our production, and by attracting population to the empty spaces of the north.

The possibility of establishing in Australia new industries dependent on the supplies of cotton for their raw material is also of obvious importance. The Executive Committee of the Commonwealth Advisory Council of Science and Industry is inquiring into the whole question of cotton growing, and the marketing and utilisation of the raw cotton, with a view to making a report on the whole matter to the Commonwealth Government.

Cotton Growing in New South Wales.

At various times the question of cotton growing in New South Wales has been considered by farmers located in different districts. With a view to testing the commercial possibilities, the Department carried out several experiments.

In 1914 samples of various kinds were distributed to the farmers in different districts of New South Wales, and an experiment was carried out under irrigation at the Yanco Experiment Farm.

In the experiments carried out at the Yanco Farm the total yields were as follows:—

Russell's Big Boll (Queensland seed) ...	620 lb. per acre.
" " (local seed)	572 lb. "
Allan's Long Staple...	603 lb. "
Sachiavilli	330 lb "
Durango	264 lb. "

These weights include both lint and seed, the proportion of lint, however, in the samples submitted was only 33 per cent. Therefore the average yield of cotton is only one-third of the above figures.

After harvest was completed samples of the several varieties were sent to the Agent-General for New South Wales, in London, in September, 1915, with the request that he should obtain a report from the Imperial Institute in London as to the value of these samples.

The report from the Agent-General advised as follows :—

		Russell's Big Boll.	
No. 1	Grown by	Mr. J. Shipway, Narromine ...	8·75d. per lb.
No. 2	„	Yanco Experiment Farm	8·50d. „
No. 3	„	Mr. W. Le Motte, Blacktown ...	9·0d. „
		Durango.	
No. 4	„	Yanco Experiment Farm	10·05d. „
		Allan's Long Staple.	
No. 5	„	Mr. C. Sherwood, Narromine ...	9·50d. „
No. 6	„	Miss K. Fowler, Pooncarie—Sample too small and mixed for valuation.	
No. 7	„	Heathwood Brothers, Casino—Sample too small for valuation; in general appearance and quality closely resembles No. 2, and would probably realise about same price, *i.e.* 8·50d. lb.	

The Agent-General states that "good middling" American cotton, at the time was worth 8d. per lb. By way of general remarks he states that on the whole the samples were of good quality, and if the yield per acre is satisfactory the cultivation appears very promising, and should be encouraged. At the time of reporting there was a scarcity of long staple cotton in the markets of the United Kingdom, and the value under such conditions rises rapidly as the length increases. Cotton of the length of 1·2 to 1·3 inch being valued at 2d. or 3d. per lb. in advance of the cotton 1·0 inch.

The Under Secretary, Department of Agriculture and Stock, Queensland, advised that the seed after it had been ginned, *i.e.*, exclusive of the lint, is worth from £14 to £14 10s. per ton.

The crop at Yanco resulted in a yield of 620 lb. per acre; of this, however, only 33 per cent is lint, so that the actual yield is 207 lb. cotton, and 413 lb. seed. The cotton is worth in London approximately £7 7s. 5d., and the seed is worth approximately £2 12s. Therefore the total gross return for both lint and seed from one acre is £9 19s. 5d. As a set-off against this, however, must be placed the working expenses.

As the total receipts were £9 19s. 5d., and the working expenses, including cultivation of land, sowing, and harvesting, were £8 2s. 4d., it will be seen that the profit is only £1 17s. 1d., and when it is remembered that *no allowance has yet been made for the cost of ginning, baling, or for freight and selling charges*, it will be seen that the cultivation of this crop, as far as New South Wales is concerned, cannot be considered profitable.

Nature Study with Corn (Maize).

H. WENHOLZ, B.Sc. (Agr.), Assistant Plant Breeder.

THE following notes have been prepared primarily as a guide to teachers in country schools who are combining the teaching of elementary agriculture with their school work, and who are located in maize-growing districts with a plot of land suitable for demonstration purposes, and on which the crop may be studied in the field during its growth.

It is hoped that it will be possible so to interest the boys in this particular crop that they will be eager to apply their knowledge when they become the farmers of the future, and that the interest created will help to keep them on the farm or attract them to farming pursuits instead of their being drawn to the towns and cities. By their knowledge of "cause of the effect," too they will be in a position to produce more and better corn than their fathers or than present-day farmers. The "Boys' Corn Clubs" in America have been a pronounced success in bringing before farmers better methods of seed selection, tillage, planting and cultivation, and soil improvement, all of which make for increased yields. The clubs have also instituted competitions that have created a healthy spirit of rivalry, which is always an incentive to further progress.

One of the essentials of progress is the faculty of observation. In the past many have been trained to be keen observers by a simple indication of the path to follow, and, on the other hand, much energy has been wasted for lack of a reliable guide or systematic course. It is realised, as far as the teachers of country schools are concerned, that many may not be in a position to devise a course of nature study with maize, and it is hoped that the following will supply a need which, perhaps, has even been felt ere now.

Structure of the Grain.

Separate a grain of corn into the following parts :-

1. *Tip Cap.*—This is the part by which the grain is attached to the cob, and which sometimes adheres to the cob when shelling (especially when immature), but more often comes away with the grain. Its removal from the grain exposes the black hilum or scar protecting the lower end of the germ.

2. *Hull.*—This is the thin skin covering the entire grain. It is easily removed by soaking the grain in water for a time. Observe that in a white or yellow grain this hull is quite colourless, but that in a red grain the whole of the red colour is contained in the hull.

3. *Aleurone layer.*—This is another thin covering of the grain immediately beneath the hull. It is more easily distinguished in a purple (so-called black) grain, in the aleurone of which the whole of the purple colour resides. This covering does not extend over the germ. It is rich in protein or flesh-forming material, and is also called the horny gluten. It contains the brightness or lustre of the grain, which loses this character on its removal. Brightness is an indication of a large percentage of protein, and bright grain, therefore, has a higher feeding value than grain of dull colour.

4. *Germ.*—This part occupies the front of the grain, and extends from the tip to half-way or more towards the crown. It contains most of the oil or fat of the grain, and when freshly cut should have a glistening appearance on the cut surface. A discoloured appearance is caused by frost or by heating in storage when too moist, in which case the grain will not germinate. The germ, which may be removed from the grain with a small sharp knife, consists of an outside covering called the scutellum or shield enclosing the delicate young shoot and root.

5. *Starchy endosperm or white starch.*—This part extends around the germ from the crown to the tip, and varies in amount in different types of grain, being almost entirely absent in flint corn, which has little or no dent in the crown, and abundant in large-dent corn which is deeply dented at the crown. The dent is caused by the starchy endosperm contracting more rapidly in drying than the horny endosperm which surrounds it.

6. *Horny endosperm or horny starch.*—This part comprises from 35 to 45 per cent. of the grain of dent corn, and determines the hardness of the grain as well as having some influence on the protein content or feeding value, as over 40 per cent. of the total protein of the grain is contained in the horny starch.

Germination of Seed.

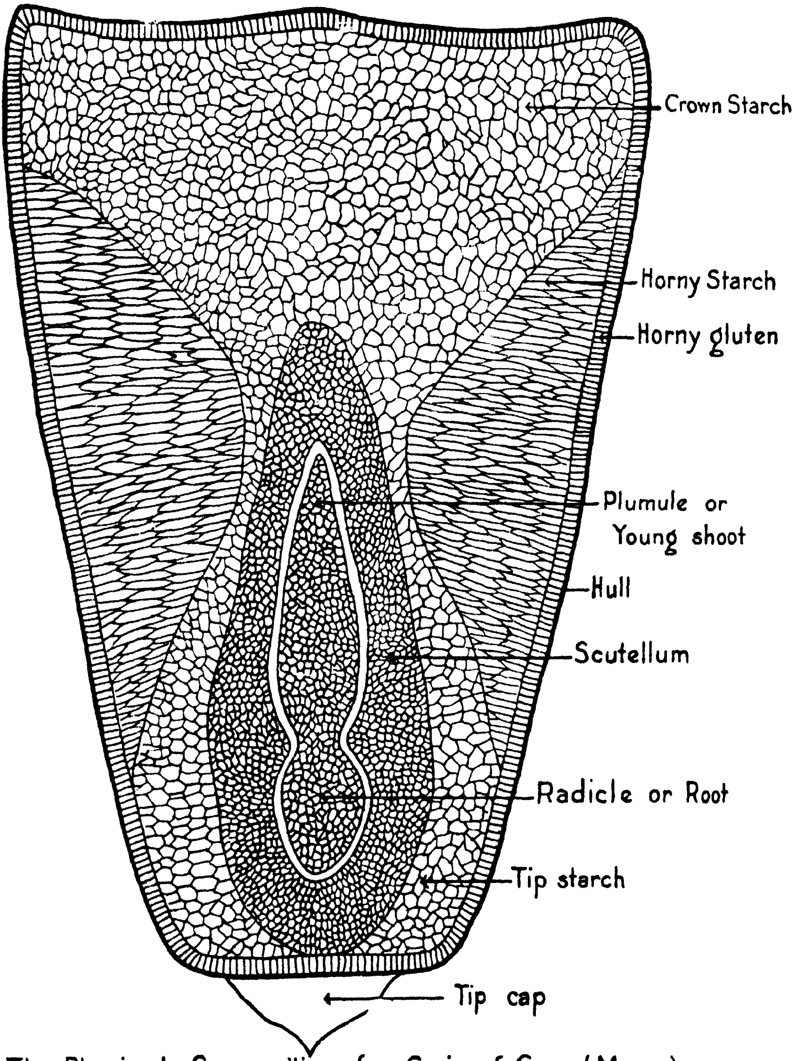
1. Take 100 grains of the corn to be planted, and test them for germination on damp blotting-paper, damp flannel, or in moist sawdust or sand. Note the number of grains germinated each day up to ten days.

2. Take 10 grains each from different cobs, keeping them separate, and test for germination, noting at the end of ten days the number of strong and of weak sprouts, and the number of grains which failed to germinate in each set of ten

3. Set out rows in the field and plant each row with grain from each of the cobs mentioned in the preceding paragraphs. Note the percentage of germination in the field, and compare with the figures given for each cob by the germination test; note also the comparative vigour of the different rows and the yields from equal lengths of the rows.

4. Germinate a few grains on blotting-paper or cloth, and note the relative times of appearance of the root and shoot.

5. Plant a few grains upside down (*i.e.*, with the tip-cap pointing upwards) in moist sand or sawdust, and after germination remove carefully, and note the way in which both the root and the shoot have reversed their direction of growth after germination.



The Physical Composition of a Grain of Corn (Maize).

NATURE STUDY WITH CORN.

6. Plant several grains at depths varying from 1 to 6 inches, in moist sand or sawdust, and note the time taken for the shoots to appear above the surface in each case, and, in addition, observe the comparative vigour of the shoots.

7. Plant several grains in the field at depths varying from 1 to 8 inches, and note the time of appearance, the percentage of germination, and the vigour of the shoots in each case.

The Seedling or Young Plant.

1. Mark the weak seedlings or young plants in the field, and observe their subsequent growth ; compare with that of vigorous seedlings or strong young plants.

2. Mark the "albino" seedlings (*i.e.*, those with no trace of green), and observe their subsequent growth.

3. Mark the variegated seedlings or young plants (*i.e.*, those with white and green transverse or longitudinal bands or stripes on the leaves), and observe their subsequent growth.

Roots.

1. Carefully dig up several young seedlings, and also some slightly older plants, about 12 or 18 inches high, and examine the roots, noting the insignificant primary root attached to the seed, and the abundance of strong secondary roots on the underground stem between the seed and the surface of the ground.

2. In several cases measure the distance below the surface of the ground at which these secondary roots originate on the stem.

3. Measure this same distance with maize planted at depths from 1 to 8 inches, and note the direction of these secondary roots.

4. Trace the lateral spread of the roots of the maize plant at the following different stages of growth, and record the greatest distance from the plant reached by the roots:—(*a*) Plants 6 inches high ; (*b*) plants 2 feet high ; (*c*) plants 4 feet high ; (*d*) plants tasselling ; (*e*) plants cobbing.

5. Measure the least distance below the surface of the ground at which roots are found at the preceding stages of growth at the following distances from the plant:—(*a*) 6 inches ; (*b*) 2 feet.

6. Measure the greatest distance below the surface of the ground at which roots are found at the preceding stages of growth, and at the distances from the plant given above.

7. How many days after planting do "brace" roots begin to form at the nodes on the stem above ground?

8. Note the greatest number of nodes on the stem at which these brace roots appear.

9. Note whether these brace roots tend to appear most on stalks that are inclined to blow down.

10. Pull up carefully a few plants which have been lodged (*i.e.*, blown down) by wind in the early stages of growth, and compare their roots with those of plants not blown down.

11. Trace the brace roots which enter the soil, and note how they branch and act like ordinary roots.

Suckers.

1. Plant several rows of corn with single grains 6, 12, 18, and 24 inches apart, and note the number of suckers in 100 plants of each row.

2. Plant several rows with two, three, and four grains together (in hills), 2½ or 3 feet apart in the rows, and note the number of suckers in 100 plants of each row.

3. Note the earliest and latest stages of the plant at which suckers appear.

4. Note the soil conditions as regards moisture, tilth, &c., at the time of appearance of the suckers.

5. Note the climatic conditions, *e.g.*, frost, night temperature, humidity of atmosphere, &c., before the appearance of suckers.

6. Observe the difference in amount of sucker formation on different kinds of soil with the same variety of maize and the same rate of planting.

7. Observe the difference in amount of sucker formation, with different varieties of maize planted at the same rate on the same soil.

8. Note the time of flowering (tassel and silk) of the suckers, and compare with those of the main stalk.

9. Note whether the suckers bear ears, and under what conditions.

10. Note the difference in amount of sucker formation in rows planted with seed from different ears of the same variety.

11. Note to what extent the smothering of young suckers by throwing up a hill of earth (about 6 inches or so) round the stalk, is effective in reducing the suckers, by comparing different rows before and after hilling and without hilling.

Barren Plants.

1. Observe the percentage of barren plants of the same variety with different rates of planting.

2. Observe the percentage of barren plants of the same variety on different soils.

3. Mark plants in the field on which the silk appears much later than the tassel, and when mature note whether they are barren or not.

4. In the field mark plants which appear weak in the early stage of growth, and also others which are strong and vigorous. Weakness may be due to insect or other damage, or it may be hereditary. Note the number or percentage of such marked plants in each class which turns out barren.

5. Note the number of barren plants in the field in rows planted with seed from different ears of the same variety.

6. Note the number of barren plants in different ear-rows, and compare this number with the number of weak seedlings in a germination test of grain from the corresponding ear.

Leaves.

1. Count the number of leaves on different plants of the same variety of maize.

2. Obtain the average number of leaves on plants of different varieties.

3. Measure the breadth of the sixth leaf from the ground for different plants of the same variety.

4. Obtain the average breadth of the sixth leaf from the ground for different varieties of maize.

5. How do the leaves act during dry weather to prevent loss of moisture?

6. Estimate the difference in length between the midrib and the margin of the leaf, and note how this fact is of value in enabling the leaves to withstand the force of strong winds without breaking.

7. In how many rows on the stalk are the leaves arranged?

8. Observe where most of the rain is conducted by the leaves of a well-grown maize plant.

9. Note the presence of the membranous ligule or prolongation of the leaf-sheath at its junction with the leaf-blade, and observe its effect in preventing rain which runs down the stem from getting between the leaf-sheath and the stem and causing the latter to rot.

10. Note the hairy margins of the leaf-sheath in having the same effect.

11. Note the absence of any leaf-clasping auricles, such as are found at the junction of the leaf-blade and its sheath in wheat, but observe the triangular-shaped fleshy areas at the base of each leaf-blade of maize, which are the auricles in this case.

12. Note what characters of the leaf seem to be associated with drought-resistant plants.

13. Note the number of days after planting at which the upper leaves, above the ear, (*a*) begin to yellow, and (*b*) are quite yellow. Determine this for different stalks of the same variety and the average for different varieties.

Tassel or Male Inflorescence.

1. Note the composition of the tassel—each separate flower being a male flower with three anthers or pollen sacs, enclosed by a pair of membranous glumes.

2. Note the position of the anthers when the flowers are ripe.

3. How does the pollen escape from the anthers?

4. Note the time in days of the appearance of the tassel from the date of planting for different plants of the same variety.

5. Note the time of appearance of the first tassel of the same variety planted at different seasons—early and late.

6. Note the time of appearance of the first tassel of different varieties planted at the same time.

7. Note, by counting the number of tassel branches, the relative abundance of the tassel produced by different plants of the same variety.

8. Note the relative abundance of tassel produced by different varieties on the same soil.

9. Note the relative abundance of tassel on plants of the same variety growing on different soils.

10. What is the least and the greatest number of days for different plants intervening between the appearance of the tassel till the shedding of pollen by the same tassel.

Silk or Female Inflorescence.

1. Note the time of appearance in different plants of the husk in the leaf axil, and the time taken for the first silk appearance after that of the husk.

2. Note the number of days between the appearance of pollen in the tassel and the appearance of the silk of the same plant. What is the least and the greatest time for this interval in different plants?

3. Carefully strip back the husk of an ear which is just silking, and note that the butt silks appear first and are the longest, and that the tip silks are short and appear latest.

4. Note that each silk is attached to an embryo grain on the cob, and bears stigmatic hairs throughout its whole length, which serve the purpose of catching the pollen grains.

5. Mark several plants which bear their silks close to the stem and others which push out their silks when the tip of the husk is well away from the stem, and observe the length of shank of such plants when mature.

6. Note the different colours of the silks—white, green, or red—and observe the colour of the cobs and grain of the corresponding ears when ripe.

7. Note that early silking plants usually have ears with tips well filled with grain, late silking plants having ears with bare tips.

The Shank.

1. Measure the length of the shank of different stalks of maize of the same variety.

2. Obtain the average length of shank of different varieties of maize.

3. Determine the average length of shank on which the best ears of a variety are found.

4. Note the thickness of the shank of different stalks of the same variety, and the average thickness of shank for different varieties. Record this by measuring the circumference of the shank.

5. Note the relation of the length and thickness of shank to the habit of the ear turning downwards at maturity.

The Husk.

1. Note that the husk covering the ear is composed of a number of leaves or bracts, arranged alternately on opposite sides of the shank similarly to the leaves on the stalk.

2. Estimate the number of bracts in the husks of different plants, and the average number of bracts in the husks of different varieties of maize.

3. Note the presence or absence of well-defined leafy husk appendages, and the relation their presence bears to good or poor ears.

4. Are these husk appendages more abundant in some varieties than others?

5. Note the difference in the protection to the tip of the ear afforded by the husk covering in different plants of the same variety, and how this character differs with different varieties.

6. Note the tightness or looseness with which the husk envelops the ear when mature in different plants of the same variety, and also in different varieties.

7. Note the coarseness or fineness of the husk, and observe whether this character is in any way related to the yield of the individual plant.

8. Note how a husk which covers the ear well and tightly prevents the entrance of weevil and of rain, while ears which are lacking in this respect become weevily or mouldy.

9. Note the number of days from planting at which the husk is—(*a*) Commencing to turn yellow, and (*b*) quite yellow. Determine this for different stalks of the same variety, and the average for different varieties.

The Ear (Field Characters).

1. Note how the size of the ear depends in part on the size of the stalk, but also that some small stalks bear good ears.

2. Note the average number of ears and the greatest number of ears produced per stalk under different conditions for different varieties.

3. Note the number of the node from the ground at which the topmost or main ear is produced, and compare this with the total number of nodes (or leaves) of the plant. Determine this for different plants of the same variety and the average for different varieties.

4. Note the height of the main ear from the ground and compare this with the height of the stalk as previously.

5. Note the appearance of the silk, husk, leaves, and stem at the following stages of growth—(*a*) grain just dented (soft milk stage); (*b*) grain well dented and glazed (soft dough stage); (*c*) grain firm (hard dough stage); (*d*) grain mature (fit to pull).

6. Note the percentage of ears turning down at maturity for different varieties.

The Stalk.

1. Insert stout pins or small nails at the nodes of the stalk and one midway between, and note in which half of the internode growth takes place.

2. Determine the weekly rate of growth in height of the stalk of maize planted at different seasons, and discover what relation this bears to the rainfall, night temperature and yield.

3. Note the different heights of stalk in the same variety on the same soil.

4. Note the average height of stalk for different varieties in different plantings, on different soils, and in different seasons.

5. Note the thickness (or circumference) of the base of the stalk of different plants of the same variety.

6. Also the average thickness for different varieties, different rates of planting, different soils, &c.

7. Note whether plants that are weak-stemmed (*i.e.*, which break below the ear) are due to rapidly tapering stalks; measure the circumference of the stalk at the base, and just below the ear node.

The Mature Ear and Grain.

1. Obtain the average weight in ounces of the ear of different varieties, giving the maximum in each.

2. Observe the general shape of the ear for different varieties—whether cylindrical or tapering.

3. Note how the grain becomes shallower and smaller near the tip of tapering ears, while cylindrical ears have more uniform grain.

4. Obtain the average length and circumference of ears of different varieties, giving the maximum for each variety.

5. Compare the roughness and depth of the dent for different ears with the length of the grain, and note that, as a general rule, the rougher and deeper the dent the longer is the grain.

6. Note that the number of rows of grain on the ear is always an even number.

7. Obtain the average number of rows of grain for ears of different varieties, and for different ears of the same variety.

8. Note that the smaller the number of rows of grain on the ear, the broader usually is the grain.

9. Note that in some ears the rows distinctly run in pairs, in others this feature is quite unnoticeable. Determine whether this character is a variety feature.

10. Observe the number of ears in each variety in which the rows curve to the right or left.

11. Are the tips of the ears well filled with grain or not?

12. In how many ears do the rows run regularly from butt to tip?

13. Is the dropping of rows from butt to tip more characteristic of some varieties than others, or is it observed more on tapering ears?

14. How many ears have butts that are well rounded and filled with grain, leaving a deep depression when the shank has been removed?

15. Determine the average diameter of the shank for different varieties, giving the maximum and minimum in each case.

16. Are the best ears those with oval or round-shaped shanks as denoted by the point of attachment on the ear?

17. Determine whether the ears which are heaviest for their size when dry have large or small spaces between the rows of grain or between the grains on the ear.

18. Determine the average breadth of grain for different varieties, or different ears of the same varieties.

19. Determine similarly the average thickness of ten grains on the ear.

20. Determine the percentage of shelled grain per ear for the same.

21. What is the average colour of core for different varieties of different ears; compare the colour of the core with the colour of grain.

22. Determine the circumference of the core of different ears of the same variety, and the average for different varieties.

23. Determine the length of grain for the same.

24. Determine the number of grains it takes of each variety to weigh 1 oz.

25. How many plants will there be to an acre with sowings of 4, 6, 8, 10, 12, and 14 lb. respectively?

26. How many pounds of grain per acre will be sown with rows 4 feet apart, and three grains every 28, 32, 36, and 40 inches apart?

Conclusion.

The foregoing notes in addition to suggesting points to teachers may also serve as a guide to farmers and farmers' sons who wish to make observations on maize in order to more familiarise themselves with details which might otherwise escape their notice, and a knowledge of which will in many cases prove helpful in understanding some of the causes of low yields, thereby enabling them to effect improvement in this direction.

They are also confidently recommended for the use of members of maize-growing competitions for boys in whom an interest has already been aroused, and amongst whom it is desirable to stimulate a further spirit of intelligent interest and inquiry.

Similar methods of study of the other main crops grown in the State should well deserve attention, and it is hoped that these crops will be dealt with in this way later through these pages.

GRASSES AT GERRINGONG.

THE following report on a farmers' experiment grass plot has been received by the Agrostologist, Mr. E. Breakwell, B.A., B.Sc., from Mr. C. T. Hindmarsh, Alne Bank, Gerringong:—

"You, no doubt, will be pleased to hear how the plot is progressing.

"The *Bromus inermis*, *Phalaris* and red clover plot is the best. The clover was well over our knees, also *Phalaris*. This plot (¼ acre) I have cut for hay, and got two good slide loads. I picked out some of the *Phalaris* and threshed the seed, getting half a three-bushel bag of seed in the rough.

"The *Festuca arundinacea* has made a good stand.

"The cocksfoot, rye, prairie, and white clover plot is now well established.

"In the paspalum plot the paspalum is just coming up. The white clover has covered the ground, and a sprinkling of lucerne and strawberry clover can be seen.

"I am very well pleased with these grass plots as they are the best I have had."

Shorthorns at Berry Experiment Farm.

J. G. McMILLAN, Manager.

UNTIL a few years ago this farm, with most of the Department's other institutions of the kind, was devoted to the breeding of animals representative of most of the dairy breeds. It was deemed advisable, however, to abolish this system and to let each farm confine itself to the breed particularly adapted to the district in which it is situated. Instead of having one breed only, however, two were allotted to Berry, viz., Shorthorns and Holsteins, the country being more suitable for those breeds than any of the other farms. The wisdom of this policy has been fully borne out by practical experience. No doubt remains that certain districts are more suitable for certain breeds than others. On the Richmond River, for instance, where the production of butter is most essential, cattle with Channel Island blood, so as to obtain more of quality than actual quantity of milk, is aimed at. Shorthorns and even Holsteins are often proving to be as high testers as any Channel Islanders. In the Illawarra district, within 80 miles of Sydney, and also up the Northern line 100 miles or so from the metropolis, where milk is produced mainly for town supply, it is the aim of the dairyman to obtain the maximum yield of milk, so long as it contains a percentage of fat in the region of 3·8 to 4 per cent. The Shorthorn is an animal that fulfils this requirement, and her calf, if not suitable for stud purposes, will at the present time realise about £2 as veal at 2 to 3 weeks old. The cow herself, should misfortune overtake her in udder troubles, &c., will realise a high price for beef. In other words the Shorthorn is as near the perfect dual-purpose animal as it is possible to get.

It is not intended here to enter into the history of Shorthorns, as this has been fully dealt with in many text books, and as these notes are being written with a view to bringing more fully before the public the utility of the milking Shorthorn.

In the early days of stock-breeding by the Department a number of cattle were imported from the British Isles. It has been considered that the English Shorthorn was inclined to lay on too much flesh at the expense of milk production. This might be due to a great extent to climatic conditions, as we find many of the English herds showing great yields, the cows being in prime condition. Importations from Ireland, however, proved otherwise, and we have at present two very fine animals in the herd, viz., Gibson Girl (imp.) and Colleen Bawn (imp.). The first-named may be justly described as an ideal animal. Her head is a typical dairy one, showing no coarseness whatever; eyes bright, prominent and placid; muzzle wide and mouth large; the neck is of a nice medium length; dewlap and brisket very light; the forequarters are particularly good, with plenty of width between forelegs, and the shoulder has the desirable wedge shape; the hindquarters can truly be termed perfect, the rump being level, long, and wide; her thighs are flat, showing no signs of beefiness: the escutcheon is large and fine in quality; the udder is of a perfect shape and very flexible; the milk veins are large and tortuous, in this respect being abnormal; the barrel is long and well sprung, if anything it could do with a little more depth; the skin is loose, but could be a little finer; the milking temperament is excellent, there being no superfluous flesh—in fact, Gibson Girl is the type of animal that no matter how she was fed the bulk of her food would go to the production of milk. It would be interesting to see what this cow would do under a special test with liberal hand-feeding as carried out in America. In one period of lactation she gave 1,100 gallons of milk; unfortunately, during that period the milk was not tested for fat. Her last completed record, 1915–16, was 9,291 lb. milk, yielding 380 lb. butter, in 294 days. She calved at the end of March last, 273 days being completed in the beginning of January, 1917. The last day of the test she gave 25 lb. milk and 1·21 lb. butter, thus showing that she is persistent in her milking habit

Gibson Girl (imp.).
Yielded 9,291 lb. of milk and 380 lb. butter in 294 days.

We are fortunate in having female progeny of Gibson Girl, viz., Lady Gibson (imported in her dam), Miss Gibson, Gibson Girl II, and Gibson Girl's Heiress. Lady Gibson is a large-framed animal, very dark roan, and although not as good as her mother, does well. Miss Gibson and Gibson Girl II, both sired by Limerick Lad (imp.), and both red in colour with a few white marks only calved a short time ago (October). They yielded as follows:—

Miss Gibson (2-year-old)—	Nov.	940 lb. milk;	43·89 lb. butter.
	Dec.	705 ,,	34·80 ,,
Gibson Girl II (3-year-old)—	Oct.	858 ,,	38·94 ,,
	Nov.	1,140 ,,	54·30 ,,
	Dec.	930 ,,	38·10 ,,

The last of Gibson Girl's offspring, mentioned above, is only 9 months old, but already she shows good type and quality. We have also two bulls from Gibson Girl—Gibson's Emblem and Gibson Girl's Heir. The first is by that famous bull, Emblem of Darbalara, and is just on 2 years old. He has grown remarkably well, and has an abnormally large escutcheon ; he is white in colour, but the yolk is a deep yellow.

The mention of white colour raises the question of colour prepotency, for which certain rules have been laid down. White mated with red gives 100 per cent. roans ; red (including red and white) with red, gives 100 per cent. red calves ; roan mated with roan gives 25 per cent. white, 25 per cent. red (including red and white), and 50 per cent. roan ; roan mated with white gives 50 per cent. roan and 50 per cent. white ; red mated with roan gives 50 per cent. red and 50 per cent. roan ; white with white gives 100 per cent. white. In practice the averages approximate the foregoing ; where colours have been properly determined the rule is borne out.

Going by these rules, so long as a farmer has the properly coloured cattle to mate with a white bull, he need have no fear of having bad-coloured calves. Only a few years ago a case was brought under notice. A well-known South Coast breeder was exhibiting at Kiama when one of his best cows dropped a white bull calf. He was so disgusted that he gave the calf to a Berry dairyman, who subsequently got from it some of the best cows in the district.

Gibson's Heir is the twin brother of Gibson Girl's Heiress, and is 9 months old and well grown. He is by Melba's Emblem of Darbalara, and almost totally red in colour ; he has a remarkably fine body—deep, long, and wide ; the skin at the twist hangs very loose and silky, and it is seldom one sees such a large escutcheon on a bull.

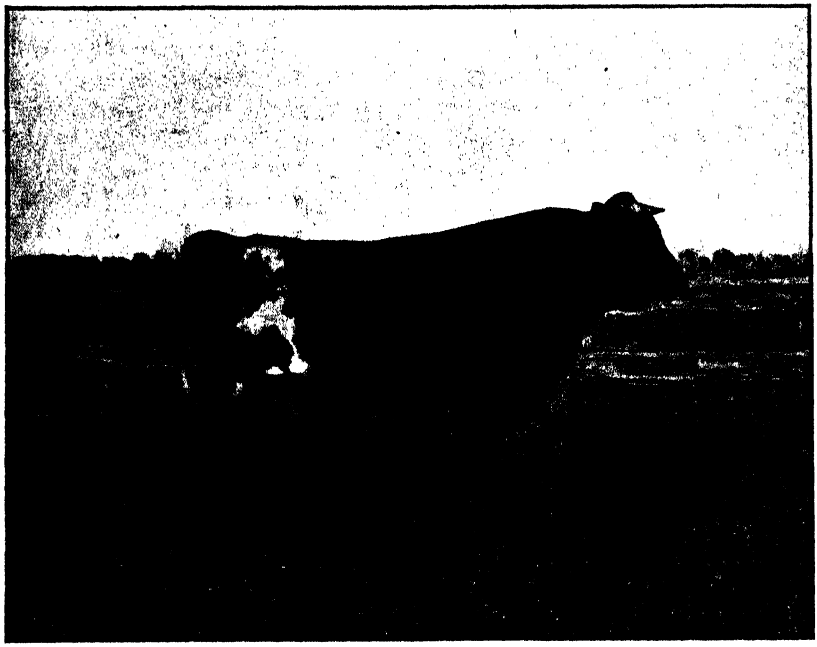
Colleen Bawn, imported at the same time as Gibson Girl, is more of a plain type, the head being particularly so, and is said by a competent judge to be very like the original class of Illawarra cattle. She has a massive frame, and is of the lean kind ; the hindquarters are very well developed ; she yields up to 5 gallons per day ; in December she yielded 1,215 lb. milk and 54·3 lb. butter. We have only one of her daughters, about 16 months old, red and white in colour, and is by Melba's Emblem.

Instead of purchasing animals at much expense from Great Britain, the Department launched out on fresh lines some two years ago by selecting from some of the best herds in the State. Naturally, one of the first herds inspected by the purchasing officer was that of Darbalara Estate. On one of his visits that district was undergoing the trials of a severe drought, and thus the Department was enabled to obtain certain stock that it would scarcely have been possible to get had conditions been good. A bull was obtained which is now at the head of the Government Shorthorn Stud, viz., Melba's Emblem of Darbalara. He is by Emblem of Darbalara (100, M.S.H.B.), by Banker of Bolaro from Madame of Bolaro ; the dam is Melba III (1,058, M.S.H.B.), by Musket II of Bolaro (43, M.S.H.B.) from Melba of Bolaro.

Emblem of Darbalara has achieved a world's record by winning the championship for the best Milking Shorthorn bull seven years in succession at the Sydney Royal Show. Melba III has been twice champion and once reserve champion (to her own stable mate, Camelia II) in the same ring. This cow's milk and butter yield for 365 days was 15,239 lb. and 653·65 lb. respectively. The records of some of Emblem of Darbalara's daughters are as follows:—

	Age.	Period of Lactation.	Milk.	Butter.	——
			lb.	lb.	
Dainty VI	2 years	12 months	8,253	440·73	1st calf.
Melba VII	2 ,,	9 ,,	8,077	412·	1st ,,
	4 ,,	9 ,,	14,622	678·	3rd ,,
Minnie VIII	4 ,,	12 ,,	11,491	470·63	2nd ,,
Virginia III	2 ,,	9 ,,	6,987	365·	1st ,,

Emblem's own dam, Madame of Bolaro, yielded 9,163 milk and 419 lb. butter in 365 days.



Shorthorn Bull, Melba's Emblem of Darbalara. Vol. IV (M.S.H.B.).

Sire, Emblem of Darbalara (130 M.S.H.B.). Seven times Champion of Sydney Royal; dam, **Melba 3rd of Darbalara (1068 M.S.H.B.).** Twice Champion of Sydney Royal, and once reserve to her stable mate, Camellia II.

With such an excellent family history the reader will expect in Melba's Emblem of Darbalara a worthy son of worthy parents, and it may be prophesied that he will not be disappointed, for we look forward to having a herd that in time will be unrivalled. Melba's Emblem is just a little over 4 years old, dark roan in colour, has a perfect carriage, and shows that very desirable character in a bull—masculinity. The head is good and the eye mild and docile. The neck is well arched and the dewlap light. The shoulder is wide, yet shows that desirable feature—a prominent chine. The bone is fine and flat, particularly so for the size of the animal. The barrel is long and wide, hindquarters well developed. The thigh, often a defective part in Shorthorns, is flat, with no indication of ham shape. The escutcheon is good, and the skin around the genital parts loose. The skin is loose and fine. The accompanying illustration will demonstrate to the reader who understands the points of a dairy bull, that the aforementioned description is in no way exaggerated.

Another bull purchased from Darbalara, and now 18 months old, is Rutland, by the champion bull Emblem. Rutland is from Sybil of Bolaro, who yielded in nine months 9,639 lb. milk and 452 lb. butter; and for the period of twelve months 12,587 lb. milk and 579 lb. butter. This test was made when the cow was 11 years old, and whilst she was running with a large herd on a share farm without any hand-feeding of any kind. Rutland is red in colour, and when fully developed will be hard to beat.

It might be thought from the fact of having three bulls all by the same sire that the Department is going in for inbreeding, but the policy is to lay the foundation for a system of line breeding if found desirable.

In addition to males, the Department has also been fortunate in obtaining some females from the Darbalara Estate, amongst others being—

Dainty VIII, by Redwood of Bolaro ex Dolly of Bolaro. Redwood was by Banker; dam, Dainty III of Darbalara.

Daisy VIII, by Emblem of Darbalara from Daisy, by Numba from Frosty.

Champion VII, by Charge of Darbalara (159, M.S.H.B.); dam Champion 4th of Darbalara, by Banker 2nd ex Champion.

Mollie IV, by Trenton by Musket 2nd, ex Lucky; dam, Mollie of Darbalara, by Banker of Bolaro.

Annie IV, by Sunrise of Darbalara, by Banker from Champion; dam, Annie of Bolaro, by Banker of Bolaro ex Sissy.

Dainty VIII is not what can be termed a robust cow; if anything she is small, but she is a great producer. She has a nice flexible udder, good teats, and fulfils the requirements of the true dairy type. At 2 years old she yielded 7,191 lb. milk and 346·49 lb. butter in 365 days. She calved in October, and during November she gave 1,386 lb. of milk, 51·81 lb. butter, and in December 975 lb. milk and 40·20 lb. butter.

In Daisy VIII we have a cow that immediately attracts the eye. She is a fairly massive cow, red and white in colour, with a glossy skin and true dairy type. The udder is one that milks out to the consistency of an empty glove. Her yield on her first calf at 2 years old was 7,663 lb. milk and 340·29 lb. butter in 333 days. During the present lactation period she has given up to 6 gallons of milk per day, and for the month of November she gave 66·66 lb. butter, and in December 1,245 lb. milk and 57·9 lb. butter. At the time of writing (the middle of January) she is still giving 4 gallons of milk, containing 4 per cent. fat.

Dainty VIII.

Yielded 7,191 lb. milk and 346·49 lb. butter in 365 days, when a 2-year old.

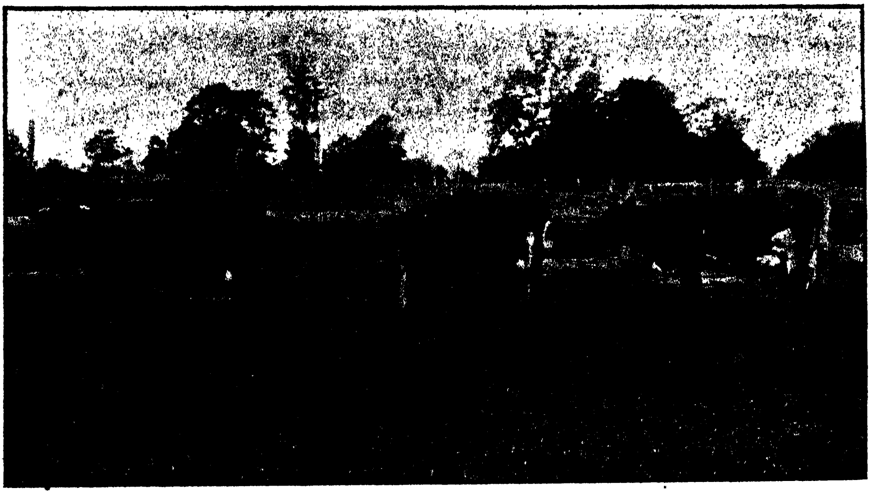
Daisy VIII of Darbalara.

Yielded 7,663 lb. milk and 340·29 lb. butter in 333 days, when a 2-year old.

SHORTHORNS AT BERRY EXPERIMENT FARM.

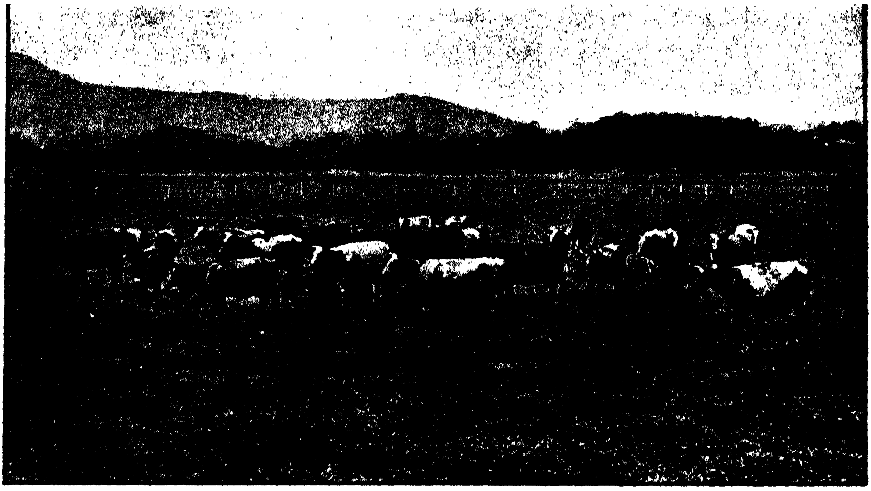
We have heifers milking from both Dainty VIII and Daisy VIII, both sired by Cameo of Darbalara. Each of them calved at the end of November, 1916, and during December yielded 735 lb. milk and 37·5 lb. butter and 853 lb. milk and 44·4 lb. butter respectively.

In the accompanying group of three, Bright Eyes of Berry appears on the right side. The heifer in the centre showing such good quality is Champion of Berry, from Champion VII. Like Bright Eyes of Berry and Dainty of Berry, she is also by Cameo. She is dark red in colour. Her mother is also red, rather undersized, but a heavy producer. Champion of Berry dropped a calf in November, and in December yielded 780 lb. milk and 35·4 lb. butter. The heifer on the extreme left is Flower of Berry, from Waratah of Berry. Flower is by Imperialist, who was bred by the late Mr. Sylvester Browne, his sire being Florio of Minembah ex Lady Nancy, the grandparents being Royalist and Rose Queen, both imported. Waratah of Berry is the largest cow on the farm, and is all red in colour Flower has not reached the dimensions of her mother, but for her first calf is milking well, giving up to 3½ gallons of milk per day.



Shorthorn Cows (reading from left) Flower of Berry, Champion of Berry, and Bright Eyes of Berry.

Other blood that has been introduced is Marchioness of Raleigh, bred by Messrs. Matthews and Young, of Raleigh. Marchioness's photo is shown here, and an indication of her fine dairy characteristics is afforded therein. Her udder is not of the best shape. In 303 days she yielded 7,098 lb. milk and 349·14 lb. butter. She calved at the end of April last, and on her last test, 3rd January, gave 21½ lb. milk, containing 4·1 per cent. fat. A daughter of this cow, Marchioness of Berry, is the replica of her mother in almost every respect, and is by Trafalgar of Raleigh (235, M.S.H.B.).



Group of Cows, comprising part of the Shorthorn herd at Berry Experiment Farm.

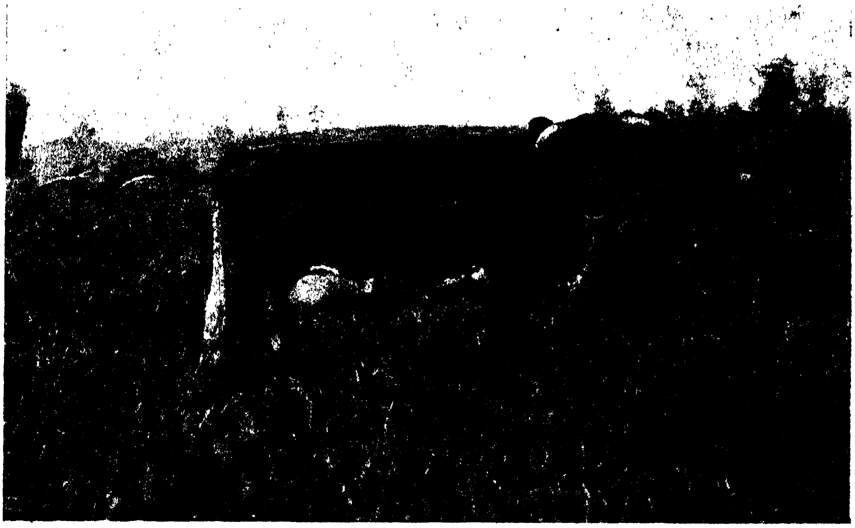
Marchioness of Raleigh.
Yielded 7,098 lb. milk and 849·14 lb. butter in 303 days.

SHORTHORNS AT BERRY EXPERIMENT FARM.

Some two years ago a number of females were obtained from Mr. T. McDonald, Wyrallah, Richmond River, amongst them being Sarah II of Berry and Easy II of Berry.

Sarah's milk is remarkably rich; for November and December her average test was 6 per cent. and 5·8 per cent. respectively. In November she yielded 64 lb. butter, and in December 49·2 lb.

Easy II, here illustrated, gave, at 2 years old, 7,149 lb. milk and 366·52 lb. butter. Her test is also high, the average for December being 4·5 per cent. Both these cows are by a bull called Barrington, by Duke of Coolangatta by Earl of Barrington (imp.).



Easy II of Berry.

Yielded 7,149 lb. of milk and 366·52 lb. butter in 333 days, when a 2-year old.

As these Richmond River animals proved so successful, a further number of heifers was obtained a few weeks ago from Mr. McDonald; some of them have calved, and show that they will make good. The only two tested so far, Orphan and Dahlia of Maryvale (both 2 years old), for December gave 840 lb. milk and 42·9 lb. butter, and 874½ lb. milk and 46·55 lb. butter respectively. Dahlia is a particularly fine beast, and bears a greater resemblance to Gibson Girl (imp.) than any other animal we have. The majority of the heifers from Maryvale are by Sterling (vol. IV, M.S.H.B.). The herd of Messrs. James Bros, Bexhill, Richmond River, is of household knowledge amongst dairymen; four heifers were recently obtained from that herd. One heifer, Gladsome of Cosey Camp, won first prize at last Lismore Show; for December she gave 808½ lb. milk, containing 35 lb. butter. Another from Cosey Camp herd is Alice III, who for December gave 1,023 lb. milk and 47·19 lb. butter. Another lot of heifers that we were fortunate in getting was from the herd of Mr. J. Sommerville, Goolmangar, Richmond River. The latter gentleman bears the name of being one of the best breeders on the northern rivers, and certainly the animals purchased from him will stand favourable comparison with any. As they have not yet calved I cannot expatiate upon their practical qualities as milkers.

For crossing purposes the Shorthorn is unrivalled; with the Ayrshire one of the finest dual-purpose crosses is produced. With the Guernsey (that is the Shorthorn cow mated with the Guernsey bull), practical experience has proved the progeny to be one of the very best for the northern rivers. Some of the dairymen in the north believe in grading this cross further with the Guernsey, whilst others, after the introduction of the Guernsey blood, have graded with the Shorthorn, notably Mr. Thomas Devery, of Alstonville, who has some remarkably fine animals.

A REPUTED FLY-KILLING PLANT.

THE Government Botanist and Director of the Botanic Gardens has received the following letter from a lady living in one of the southern Sydney suburbs:—

> I would be much obliged if you could tell me the name of the enclosed wild flower, and whether it is known to possess the property of killing flies and mosquitoes?
>
> A bunch of these flowers was brought home and put in water; the next day the vase was strewn round with dead flies and mosquitoes. The flies lodge on it and extract the honey, like bees, but the poison does not take immediate effect.

Mr. Maiden, in commenting on this note, states:—"The plant in question is *Lomatia silaifolia*, a small plant with fern-like leaves, and white flowers, very common in eastern New South Wales.

"A number of years ago, the then collector of the Technological Museum, informed me that he had known a bunch of this plant in flower, if put in the hearthplace, to kill flies, and on another occasion a correspondent gave similar testimony.

"I shall be glad to hear if this experience is a general one.

"Of course, the proper way to deal with the fly pest is prevention, but if a plant like this is a proved fly-killer, it will be of real value."

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director of the Botanic Gardens, Sydney.

The Petty Spurge (*Euphorbia peplus* L.).

(*Euphorbiaceae*: Spurge Family.)

Popular Description.—A bright green, erect plant, a few inches high, with inconspicuous greenish flowers, the whole plant exuding a milky juice, hence it is known, in common with its close relations, as " Milk-weed " in Australia, but asclepiads, also with Milky Juice, share this name also. Common in gardens and on rubbish heaps.

Botanical Description.—An erect glabrous annual with milky juice. Leaves orbicular-obovate, entire. Umbel of two or three repeatedly forked rays, Involucral glands crescent-shaped, with long points.

Meaning of Name.—The derivation of the word Spurge is *viâ* the French from the same word as "purge," indicating its medicinal effects. The word is applied to all species of the genus *Euphorbia*, and I would add that it is far too drastic and uncertain in its effects to be safely used as a purgative medicine.

The word " petty " is from the French *petit*, small, and indicates that it is a small plant in comparison with some others.

Economic Value.—In common with the rest of the *Euphorbias* it has from time immemorial been used in Britain and Northern Europe as a wart-cure, and hence the name "Wart-weed," applied to it and some other allied plants. In country districts when local irritation is caused by its application, a very old remedy is to apply oil freely.

For some years past the juice of this little plant has been recommended (to my knowledge) by Sydney physicians of the highest standing for the treatment of rodent ulcer, and I have seen cures effected by its means. But I certainly would not recommend its use (except for warts) unless under the care of a physician, for the juices of such plants are too dangerous to be employed except under proper safeguards.

From the note which follows, it will be observed that the milky juice (latex) affects the photographic plate, and it may be that it contains some radio-active principle which explains the cure to which I have alluded :—

ACTION of the latex of *Euphorbia peplus* on the photographic plate.*

The milky juice or latex of this plant has been employed by surgeons for the treatment of rodent ulcer. It has occurred to us to test whether the dried latex has any action on a photographic plate. A thin layer of the juice is spread on glass and is dried. A photographic plate is placed a little distance above the dried film. When the plate is developed after three to seven days an image of the film appears on the plate. If a word be written with the juice a well defined photograph of the word appears on the plate. Such an image appears when the distance between the film and the plate is not more than one centimetre. The thicker the film of dried juice the more dense is the image on the photographic plate. If tissue paper, thick paper, thin aluminium foil, or gold leaf be placed between the photographic plate and the film the image is produced in the same way and is sharply defined. If glass or mica be interposed the photographic plate is protected and no image appears. We have been unable to obtain glass or mica less than 1-100th mm. in thickness.

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* H. G. Chapman, M.D., B.S., and J. M. Petrie, D.Sc., F.I.C.—Report of the *Australasian Association for the Advancement of Science*, Vol. XIII, 1912.

The film of latex may be heated to 200 C. without any diminution of its action on the photographic plate. At this temperature it commences to char, and the action on the photographic plate remains powerful despite the destruction of the organic matter. When the ash becomes white the action on the photographic plate is much lessened. The photographic effect is also obtained during the passage of a dry air or of carbon dioxide, also under greatly reduced pressure.

Habitat.—We do not know the original home of this plant, but we know that from immemorial antiquity it has been known in Europe, Western Asia, and North Africa. It has spread over most parts of the world, and it is common in the coastal districts of most of the Australian States. It is a weed of arable land and occurs on rubbish heaps everywhere. It would appear to be difficult to break up land without the minute seeds of this Spurge finding a lodgment and covering the ground with its bright verdure.

Structure of Flower.—At figures 1 and 2 we have a peculiar inflorescence which bears the technical name of *Cyathium*, and which looks like a simple flower, but it consists of one pistillate and several staminate flowers. The *Cyathium* has a small cup-like involucre (see in section in figure 2) which is formed by the union of five *bracts*, which collectively surround a number of flowers. At the points of junction of four of these bracts are four crescent- or horn-shaped *nectaries*, often described as *glands*. Within the involucre are a number of *stamens*, and *scales* (note their feathery tops) are also seen. A *staminate flower* consists of a flower-stalk terminated by two stamens, and subtended by one of the scales just referred to. The *pistillate* or *carpellary flower* (female flower) can best be seen at figure 1, where it seems to be falling out of the *Cyathium*.

The flower of a *Euphorbia* is said to be naked (achlamydeous), that is to say, without either a calyx or a corolla.

Note the fruit (figure 3) when ripe beginning to separate into its three constituents carpels, which contain the seeds.

EXPLANATION OF PLATE.

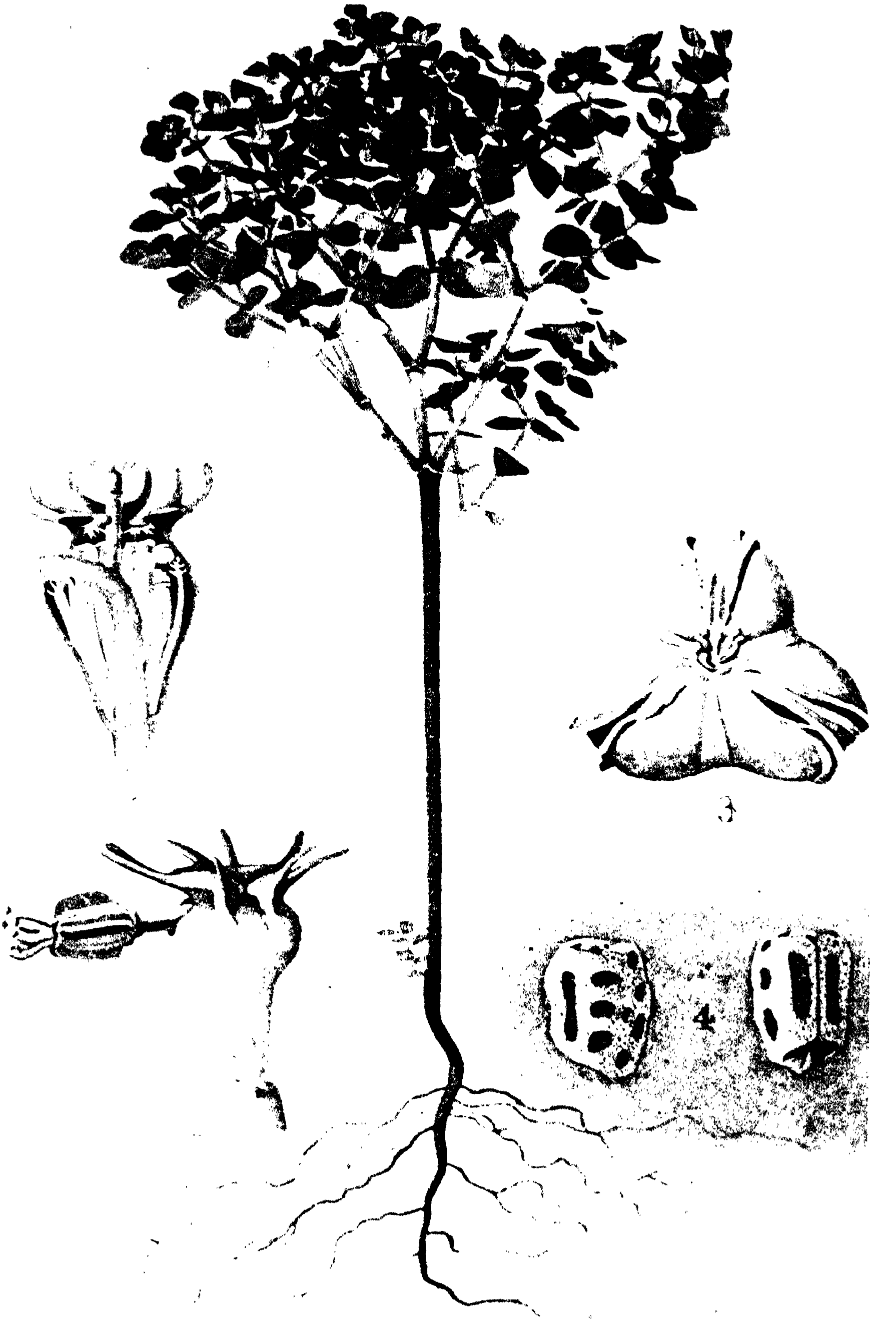
1. Flower, showing the cup-shaped involucre (Cyathium), terminated by the four horn-shaped glands, and a maturing pistillate flower to the left.
2. Flower with front of the involucre removed, exhibiting stamens, scales, &c.
3. Fruit, dividing into three carpels.
4. Seeds, showing depressed dots.

Bushy Starwort (*Aster subulatus* Michx.).

(Family COMPOSITÆ: Daisy Family.)

Popular Description.—A rather wiry branched plant, bearing a profusion of not showy small white, daisy-like flowers, and small, narrow leaves. Its usual height is about 2 feet.

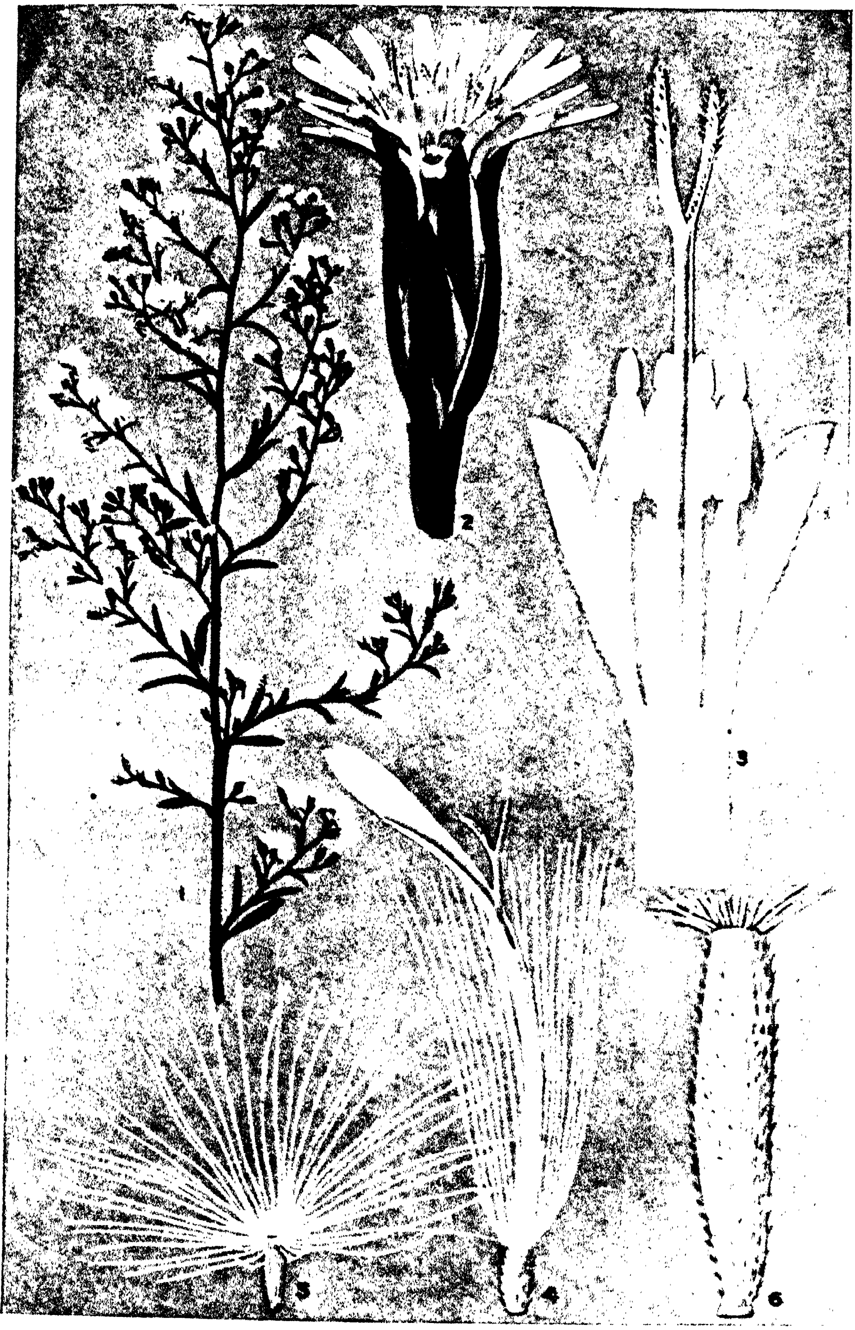
Botanical Description.—An erect herbaceous biennial with a paniculately branched inflorescence. Involucre narrow turbinate; outer florets ligulate; achenes shortly pubescent, pappus bristles simple.



WEEDS OF NEW SOUTH WALES.

"PETTY SPURGE."

Euphorbia peplus L.



Weeds of New South Wales.

"BUSHY STARWORT."

Aster subulatus Michx.

Vernacular Names.—"Bushy Starwort" is one of those manufactured names that I very much dislike, but it is either that or *Aster subulatus*, which is probably no more difficult to remember, and much preferable. The word "Starwort" is sometimes given to Asters. It is sometimes known as "Cobblers' Peg," but this name is better deserved for *Erigeron.*

In Britton and Brown's "Illustrated Flora of the United States" it goes under the name of "Annual Salt-Marsh Aster" from its favourite habitat.

Habitat—It is a native of the eastern United States, in salt-marshes, from the coast of New Hampshire to Florida.

It is common in New South Wales, it having been recorded as *Aster dumosus* L. for many years. This is a closely allied species, but as our New South Wales plant has been determined as *A. subulatus* by a well known American botanist, his determination has been accepted, and those who wish to look up the references may turn to the Proceedings of the Linnean Society of New South Wales, xxxiv, 363, for the year 1909.

Properties.—This Aster is an aggressive coloniser which has taken possession of large areas in New South Wales, usually in damp situations, in districts so far apart as the coast and Brewarrina. Except that it is not ornamental and is of very little fodder value, I have no specific charge to make against it, for it does not appear to possess any injurious property whatever. It is simply a cumberer of the ground—one of many plants that, under ordinary circumstances, possesses no positive virtues, and no special vices.

EXPLANATION OF PLATE.

1. Flowering branch.
2. Flower.
3. Floret opened to show stigma and anthers.
4. Ligulate floret.
5. Achene showing arrangement of pappus.
6. Achene (seed) much enlarged.

AGRICULTURAL LENDING LIBRARY.

THE Principal Librarian of the Public Library of New South Wales desires that attention should be drawn to the Country Reference Section, in which parcels of from one to three reference works are lent for one month from date of issue (unless an extension of time be applied for and granted). These books are forwarded by post only, and are lent free of all charge, excepting the return postage, which must be paid by the borrowers.

The section includes a large number of valuable works on agricultural and allied subjects, such as bee culture, fruit growing, poultry farming, dairy farming, horse breeding, sheep raising, veterinary science, &c., and readers of the *Gazette* who desire to supplement their knowledge in this direction are invited to get into communication with the Public Library and obtain further details of the scheme.

A Descriptive Catalogue of the Scale Insects ("Coccidae") of Australia.

[Continued from Vol. XXVII, page 888.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

Genus XXXVII. *Pseudococcus*, Signoret.

Ann. Soc. Ent. France (5), vol. v, p. 329. 1875.
Comstock, *U.S. Dep. Agric. Report*, 1880, p. 345.
Newstead, *Mon. British Coccidæ*, vol. ii, p. 176. 1903.
Phenacoccus, Cockerell, *Ent. News*, vol. iv, p. 318. 1893.
Paroudablis, Cockerell, *The Entomologist*, vol. xxxiii, p. 87. 1900.

THE members of this genus are closely related to those of the preceding one. The adult female is a dactylopid coccid with nine-jointed antennæ. The male coccid is furnished with four caudal filaments instead of two, but there is no apparent difference in the larval forms of the two genera. Newstead says: "In the majority of the species the ovisac is very elongated, and composed of white felted or flocculent secretion, in which the female completely envelops herself at the period of parturition. Before the period of the formation of the ovisac, the females are decidedly active."

Three of our Australian species come into this group.

Pseudococcus casuarinæ, Maskell.

Trans. N. Zealand Institute, vol. xxv, p. 235, pl. xvi, fig. 5. 1892.

Type specimens found at Myrniong, Victoria, on an undetermined species of *Casuarina*.

The adult female is enveloped in white cottony secretion forming a globular mass, sometimes irregular in form, and hardly a true ovisac.

The adult coccid yellowish brown, elliptical, slightly convex. Length, 1/5 of an inch. Antennæ nine-jointed; the second longest; the others diminishing in length to the eighth; ninth as long as the sixth. Feet long, stout; digitules fine hairs. Anal tubercles very small. Anal ring with six hairs. Epidermis covered with circular spinnerets and fine short hairs; on the margin of each segment on either side a group of orifices and conical spines.

398. *Phenacoccus casuarinæ*. Cat. Coccidæ, p. 90.

Pseudococcus nivalis, Maskell.

Trans. N. Zealand Institute, vol. xxv, p. 234, pl. xvi, figs. 1–4. 1892.
Phenacoccus nivalis, De Charm, *Pro. Soc. Amicale Scientique*, p. 42, pl. iii, figs. 3–3a. 1899.
Phenacoccus nivalis, Cockerell, *Check List Coccidæ*, p. 325. 1896.
" " Cockerell, *The Entomologist*, vol. xxxiii, p. 86. 1900.

This species was sent to Maskell, from either Brisbane or Sydney (the exact locality is doubtful) upon an undetermined species of acacia.

The adult female is covered with white cottony secretion above, but also produces a lighter cottony ovisac, often prolonged behind the insect. Adult female yellowish brown, form elliptical, slightly convex. About $\frac{1}{12}$ of an inch in length. The insect secretes a quantity of white cottony matter covering the dorsal surface, together with a more felted mass, covering the ovisac, which is like that of *Pulvinaria.* Antennæ composed of nine joints; the first short, second longest, succeeding ones smaller, with the terminal one as long as the fourth; the fourth to sixth slender. Feet long, slender, tarsi with fine hairs; no digitules on the claw. Anal tubercles very small; anal ring with six hairs. Epidermis with groups of conical spines; circular spinnerets on either side, and scattered over the dorsal surface of the abdominal segments.

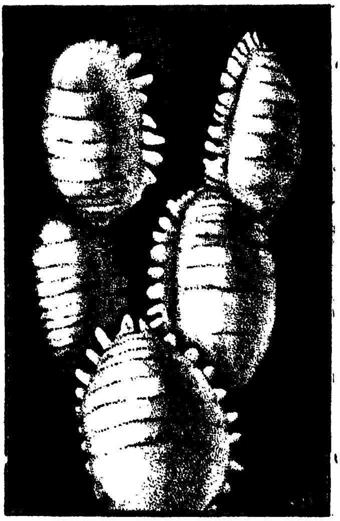
According to Cockerell, the species described from Mauritius by M. d'Emmerer de Charmoy on *Solanum* under the name of *Phenacoccus nivalis*, is a distinct species and not this coccid.

410. *Phenacoccus nivalis.* Cat. Coccidæ, p. 92.

Pseudococcus stolatus, n.sp.

This species is not uncommon on the small branchlets of the scrub tree known as the dogwood (*Myoporum deserti*), thickly coating the bark with their oval white sacs. I have it from Cobar, Dubbo, Condobolin, and Bourke districts, New South Wales. This species was determined by Mr. E. E. Green.

Adult female enclosed in an oval sac of light biscuit brown colour, felted, distinctly ribbed with transverse lines as if marking the segmental divisions of the coccid beneath; often covered with white mealy secretion and the margins fringed with short fingers of white woolly filaments, with a circular anal aperture.



Pseudococcus stolatus, n.sp.

In the small immature females the whole surface is clothed with tufts of white filaments, and they look like some of the mealy bugs of the genus *Icerya.*

Adult female elongate, elliptical, pale yellowish brown. Length, $\frac{1}{8}$ of an inch; antennæ long, composed of nine joints; first short broad, second cylindrical, third slightly longer, fourth to seventh about equal length, eighth longer; ninth slightly longer than the eighth, rounded at tip with scattered hairs. Feet long slender, tarsus with hairs on either side, two short clubbed digitules. Anal ring with six hairs; anal tubercles small, inconspicuous; epidermis thickly covered with circular spinnerets, short rod-like processes, and short blunt spines, the latter forming groups on the edge of the abdominal segments.

Genus XXXVIII. *Epicoccus*, Cockerell.

Ann. and Mag. Nat. History (ser. 7), vol. ix, p. 24. 1902.

This genus is defined by Cockerell as a *Dactylopid* with the anal ring without hairs; adult female with legs and antennæ; the latter well developed, cylindrical, six-jointed, the last joint long. It was created to contain a remarkable coccid that Maskell described under the name of *Coccus acaciæ*.

Epicoccus acaciæ, Maskell.

Coccus acaciæ, Trans. N. Zealand Institute, vol. xxix, p. 319, pl. xxi, fig. 4. 1897.
„ „ Fuller, *Trans. Ent. Soc., London,* p. 439. 1899.
Epicoccus acaciæ, Cockerell, *Ann. and Mag. Nat. History,* vol. ix, p. 24. 1902.

This curious coccid comes from near Perth, Western Australia, upon an undetermined small thorny acacia.

Adult female dark red, with yellowish tints, semi-globular, segmented and wrinkled. Diameter, about $\frac{1}{12}$ of an inch.

Antennæ composed of six joints, sixth longest, the third large, the rest of the segments short and of about equal length. The feet long, tibia slightly longer than the tarsus; all the digitules fine hairs. The anal tubercles very small. Anogenital ring small, simple, without hairs; margin without spines or hairs; the epidermis showing very few circular spinnerets.

Maskell described this species from dead specimens. Fuller in his description of the live coccids describes them as most brilliantly coloured.

388. *Epicoccus acaciæ.* Cat. Coccidæ, p. 89.

Genus XXXIX. *Lachnodius*, Maskell.

Trans. N. Zealand Institute, vol. xxviii, p. 400. 1896.

The members of this genus are peculiar to Australia, and are found upon *Eucalyptus* and *Acacia.*

Maskell defines the genus as follows:—"Female insect active or stationary; naked or covered with cottony, mealy or waxy secretion. Body segmented. Antennæ of seven or eight joints, of which the last is not longer than the others; mentum monomerous; anal tubercles small or obsolete. Anogenital ring with more than eight hairs.

"Male insects normal of *Dactylopinæ*.

"The seven-jointed antennæ would not in itself be a distinctive character, but the shortness of the last joint, the monomerous mentum, and the hairs of the anal ring are quite sufficient."

Lachnodius eucalypti, Maskell.

Dactylopius eucalypti, *Trans. N. Zealand Institute*, vol. xxiv, p. 35, pl. vii, figs. 9–13, 1891; vol. xxv, p. 233, 1892; vol. xxvii, p. 65, 1894.
Lachnodius eucalypti, Mask, figs. 9–13, 1891; vol. xxviii, p. 400, 1896.

Type specimens collected by Crawford upon the bark of *Eucalyptus amygdalina*, South Australia, upon the leaves of *E. robusta*, Botany, and at Wallsend, New South Wales, on the foliage of *E. siderophloia.*

The female attaches herself to the upper surface of the leaf, causing a circular depression in the centre of a reddish blotch in the tissue of the leaf. The coccid fits into this pit, the dorsal surface raised a little above the rim showing transverse markings covered with fine dull white cottony secretion.

Adult female, circular, flattened on the dorsal surface, convex beneath in the pit; at first lightly covered with grey mealy secretion, thickest on the margin; later on producing more white, longer filaments. Diameter, $\frac{1}{10}$ of an inch. Dull red, antennæ seven-jointed, the third longest, the seventh hardly longer than the sixth. Legs with rather short tarsus, only one-third the length of the tibia. Digitules fine long hairs. Anal tubercles very small. Anal ring with a number of fine hairs. Epidermis with many small spinnerets, and a number of long spiny hairs on the cephalic portion.

The males enclosed in sacs of loose white cotton; sometimes these tests are scattered among the females, at other times clustered together by themselves on the foliage.

434. *Lachnodius eucalypti.* Cat. Coccidæ, p. 95.

Lachnodius hirtus, Maskell.

Trans. N. Zealand Institute, vol. xxviii, p. 402, pl. xxii, figs. 1–9. 1896.

The specimens were collected on the foliage of a wattle (*Acacia* sp.) at Thornleigh, New South Wales.

The adult female dark purple, covered with fine short white filaments over the fine hairs clothing the dorsal surface; general form sub-globular. Diameter, from $\frac{1}{5}$ to $\frac{1}{4}$ of an inch. Antennæ with seven joints; the third longest; all the joints with a few hairs on the sides. Legs stout and long; the tibia three times the length of the tarsus with several long spines; tarsus short and thick with two slender spines; claw short; no digitules on tarsus or claw. Anal ring with about twenty hairs. Abdomen truncate at tip with no anal tubercles, but two of the dorsal hairs project beyond the margin.

" The excessive pubescence and the strongly spined and spurred tibiæ will distinguish this species."

435. *Lachnodius hirtus.* Cat. Coccidæ, p. 96.

Lachnodius lectularius, Maskell.

Trans. N. Zealand Institute, vol. xxviii, p. 40, pl. xxi, figs. 12–19. 1896.

The type specimens were collected on the twigs of young gums (*Eucalyptus rostrata*) growing at Mooroopna, Goulburn River, Victoria. These coccids formed depressions in the tissue of the twigs. Specimens collected at

National Park and other localities near Sydney, New South Wales, attack the tips of the young shoots of *Eucalyptus corymbosa*, forming an irregular mass pointed at the tip, with the sides folding together, forming a box-like gall open along the dorsal surface.

The adult female is dark red to reddish brown, convex and segmented; about ⅛ of an inch in length. Antennæ composed of seven joints, the third longest, each with a few hairs. Legs stout, thickened, tibia twice as long as the tarsus, with spiny hairs on each joint. Digitules fine hairs. Anal ring large, with from twenty to twenty-four hairs. The margin of the body with closely set, long, strong spines, each springing from a ringed tubular base. The epidermis covered with fine hairs; at the extremities masses of stronger spiny hairs, and on the abdominal segments a great many circular orifices.

436. *Lachnodius lectularius*. Cat. Coccidæ, p. 96.

Genus XL. *Ripersia*, Signoret.

Ann. Soc. Entom. de France, vol. v, p. 335. 1875.
Newstead, *Monograph British Coccidæ*, vol. ii, p. 182. 1902.

The adult females resembling those of the allied genus *Dactylopius*. The antennæ vary from five to seven joints; anal lobes very variable, legs present. They live underground upon roots and are often found in ants' nests, but the ants may often be attracted to, and make their nests around, them. They are like most subterranean coccids, usually more or less coated with a mealy secretion, and have short anal appendages.

There are thirty-six species described from all parts of the world, but nearly two-thirds of them are peculiar to North America. Two are found in New Zealand and one in Australia.

Ripersia leptospermi, Maskell.

Trans. Royal Society, S. Australia, p. 106, pl. xiv, fig. 5. 1888.
Trans. N. Zealand Institute, vol. xxv, p. 235. 1892.
Newstead, *Ent. Month. Mag.*, vol. xxviii, p. 147. 1892.

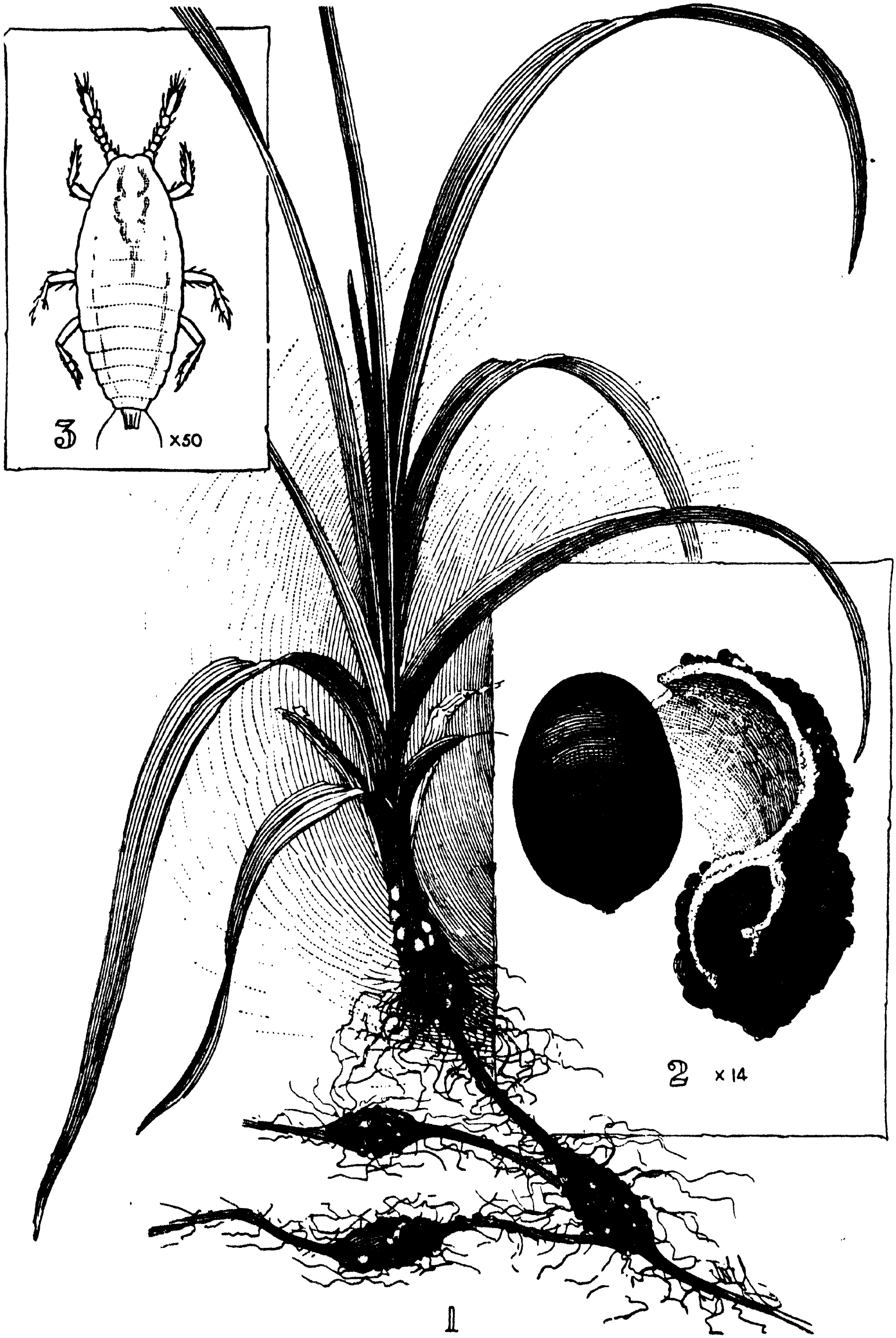
This species was collected near Adelaide, South Australia, by Mr. Crawford upon an undetermined species of *Leptospermum*. This is a small species, the adult female measuring $\frac{1}{30}$ of an inch, and with the surrounding cotton ⅛ of an inch in length. It is dark purple, covered with white meal, and surrounded with curling white filaments of cotton. The coccid is flattish, sub-circular, carinated on the back, but the segmentation not very distinct; the legs long, slender; anal tubercle inconspicuous, with short setæ.

573. *Ripersia leptospermi*. Cat. Coccidæ, p. 118.

Genus XLI. *Antonina*, Signoret.

Ann. Soc. Entom. de France, vol. v, p. 24. 1875.
Newstead, *Monograph British Coccidæ*, vol. ii, p. 207. 1902.
Laboulbenia, Lichtenstein, Mittheil, *Schw. Ent. Ges.*, vol. v, p. 229. 1878.

The members of this genus are subterranean in their habits, attaching themselves to the roots of grasses, sedges, and bamboo. A small group



The Nut Grass Coccid. (*Antonina australis.*)
1.—A specimen of Nut Grass showing the coccid on the roots. 2.—A mature female coccid sac.
3.—The larval coccid.

SCALE INSECTS OF AUSTRALIA. PLATE XXVI.

containing eight described species from Europe, America, Japan, New Zealand and Australia. The type was described by Signoret from France on the roots of a grass. Newstead defines the genus as follows :—"Adult female without legs; anal lobes rudimentary; antennæ atrophied, or rudimentary; anal orifice with six hairs. Ovisac felted, or solid and wax-like. Larva with the anal lobes well developed; antennæ composed of six joints, and the anal orifice with six hairs."

Antonina australis, Green. (Plate xxvi.)

Proc. Linn. Soc. New South Wales, vol. xxix, p. 463, pl. xvi. 1904.
Froggatt, *Agric. Gazette, New South Wales*, vol. xv, p. 407, pl. 1, figs. 1–3. 1904.

This is the well-known "nut-grass coccid," discovered on the roots of nut-grass (*Cyperus rotundus*) in the Singleton district, New South Wales. It was claimed at one time that it was a useful coccid of economic importance as it only attacked the nodes of the nut-grass, which is a serious pest in fields and gardens. In some areas where the ground is not ploughed or disturbed, it does to some extent check the growth of the nut-grass, but only to a slight extent and chiefly in dry seasons.

The adult female is almost globular, fitting into a cavity in the soil attached to the root covered with white floury secretion. General colour dull purple; smooth, shining, and easily removed from the cavity and felted secretion. Length, from 2 to 3½ mm. Antennæ minute consisting of two irregular joints; legs wanting. The whole surface of the body covered with circular spinnerets with some small hairs.

(*To be continued.*)

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

A Disease of Spring Flowering Bulbs.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

FROM time to time a number of diseased daffodil, narcissus, and other bulbs have been submitted to the Department for examination.

The diseased bulbs generally showed healthy fleshy bulb scales in the interior, and similarly healthy ones on the exterior, while the intermediate bulb scales were brown and decayed, the decay starting near the apex and travelling downwards. Less frequently the internal bulb scales or the external bulb scales were discoloured and diseased, and, in the case of the latter, easily broke away at their base. As is the case in all decay, numerous bacteria were present. Several fungi were isolated from the diseased bulbs, but investigation led to the view that they were not the primary cause of the disease.

The following explanation of the origin of the disease seems the most feasible. The reserve food material in a bulb is for the most part in the form of starch, which, during the growth of the bulb, whether throwing out foliage leaves at the commencement of the season, or forming a new bulb at the end of the season, is in a state of flux, much of it then being in the form of sugar.

When a bulb is lifted from the ground too early, before the foliage leaves have completely died off, the bulb scales contain a large amount of this sugar. At this stage the bulb appears to be peculiarly liable to the attacks of fungi, and, receiving a check through severance from its root system, easily falls a prey to them. Even after the foliage leaves have died down the bulb requires several weeks to mature and to become really ready for lifting.

On some of the foliage leaves of the daffodils examined numerous little tuberosities have been present, somewhat yellow in colour, that were found to be filled with eel-worms, and occasionally a whole bulb has been found to be infested with eel-worms, possibly of a different species. The injury caused by these eel-worms appears to be distinct from the rotting disease of the bulb scales described above.

Those who have found their bulbs to be suffering from the rotting disease are advised to allow them to become mature, and to this end to leave them in the ground for about three weeks after the foliage leaves have completely withered before lifting them.

We have not had for examination any hyacinth bulbs, but Sorauer has described "A Ring Disease of Hyacinth Bulbs," which corresponds closely in character with the disease of daffodil bulbs examined by the Department.

He gives some advice upon the treatment of affected bulbs as well as a description of the effects of manure; a translation of his article is therefore appended.

THE RING DISEASE OF HYACINTH BULBS.

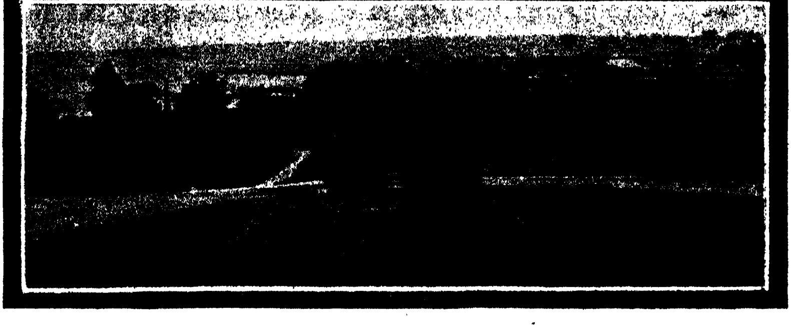
This disease is very serious for growers of hyacinth bulbs. It manifests itself by the browning and loosening of a scale in the midst of healthy bulb layers. The decomposition of the tissue progresses from the neck of the bulb downwards into the bulb centre. If it reaches the latter the bulb is as good as lost. The disease is often transmitted to the bulblets. All the diseased parts become covered with *Penicillium* (mould) which here has actually taken on a parasitic character. The reason for the extremely rapid spread of the fungus is to be found in the change of the substratum which proves unusually favourable to it. Analyses show especially that fresh, *healthy* substance of the ring-diseased bulb possess s more sugar than that of healthy specimens. The former resemble younger scales in contrast to the older ones. Since now a reduction of the sugar takes place with the increased ripeness of the bulbs, we shall have to conclude from the greater amount of sugar that diseased bulbs are less ripe.

In fact it may be proved that by their cultural methods our bulb-growers often run a risk of harvesting unripe bulbs. In taking up the bulbs, the grower sometimes does not wait until the leaves have completely dried up in summer. This holds good primarily when the hyacinths serve as decorative plants in gardens and public places. There a bed of old flowers and slowly-yellowing leaves is unsightly. Consequently, the bulbs are lifted and allowed to ripen in another place. The resulting great injury to the root prematurely checks the vegetative growth of the bulbs. The leaves dry before they have lived out their life, and their bases, *i.e.*, the scales of the bulb, remain immature and rich in sugar, thereby forming the desired centre for convenient infection by the fungus. In the larger field-grown commercial bulbs, the supply of fertilizer enters into the question, since it is desirable to produce very strong bulbs in the shortest possible time. The fertilizer so lengthens the time of growth that many varieties have not finished growth at the time fixed for harvest. The leaves, still green, then possess, in every case, unique scales (*i.e.*, scales unusually rich in sugar), and during the storage of the harvested bulbs on the "bulb floors," up to the time of the autumn sales, *Penicillium* (mould) has ample time to attack the scales which remain rich in sugar, and to destroy them. It is a matter of course that varieties ripening especially late will exhibit this bad condition, and the growers, therefore, speak of "ring-diseased races."

The testing of the bulbs is accomplished by cutting superficially through the tip of the neck during the dormant period. If the cross-section shows a brown ring between the white scales of the bulbs, these bulbs should not be sold.

Stock suffering from ring disease can be cured by putting the bulbs in sandy soil, not freshly manured, with a deep lying ground-water level, where, with scarcity of nutriment and moisture, they can ripen early.

The fact remains to be mentioned that a phenomenon has been confused with the real ring disease, which is very similar to it. The cause is known to be a nematode (*Tylenchus hyacinthi* Pr.), which can wander into the scales from the leaves.



Poultry Notes.

FEBRUARY.

JAMES HADLINGTON, Poultry Expert.

THERE is evidence that during the coming autumn there is likely to be a good deal of activity in regard to starting poultry farms, and remodelling existing ones. Where this class of work is to be done no time should be lost in making the necessary dispositions. Whatever is to be done in this line should be carefully thought out with a view to the future extension of the farm. The average poultry farm has been a thing of small beginnings, usually jumbled together without any definite plan or objective beyond keeping as many fowls and rearing as many chickens as circumstances would permit, and the result is a general lack of systemisation.

A Definite Objective.

It should be the aim of poultry-farmers, whether in a large or a small way, to make an attempt to plan and systematise both their plants and their work to a much greater extent than has been the case in the past. It is only in this way that a great deal of the worrying detail and drudgery incidental to much of the work on old lines can be eliminated. It is, however, satisfactory to note an improvement in this direction. The following points on selecting a site and starting a poultry farm will, perhaps, be of assistance.

Points in Selecting a Site.

(1) A northerly or north-easterly aspect is the best.

(2) Give preference to high ground with a gentle slope, not too much exposed to south-west winds.

(3) Secure good surface drainage, and avoid positions where seepage is likely to occur at the foot of hills.

(4) Avoid flats and gullies.

(5) Give preference to sandy soils, compared with those of clay formation.

(6) Rocky positions will be found troublesome in the matter of erecting fences and laying out the farm generally.

(7) Give preference to land in its virgin state over that which has been cultivated.

(8) An adequate provision for water is very important.

(9) Five acres is an area quite small enough upon which to start poultry farming for a living. True there are many poultry farms of much less extent, where the occupant appears to be making a living, and perhaps is doing so; but sooner or later the fact that the area is too small will be realised. It is

not sufficient to point to a few years' experience as evidence of success in such cases. The troubles incidental to such intensive poultry farming might then only just be beginning to make themselves felt.

Points in Starting a Poultry Farm.

(1) However small the farm, a ground plan should be prepared before any buildings or fences are erected. This plan should provide room for the extension of every class of building it is intended to erect, and the possibilities in this direction should be well thought out.

(2) If means will allow, it is more economical to construct buildings of a permanent character. Such buildings should be worth their cost many years after construction.

(3) Avoid narrow lanes and passages; they mean a quagmire in wet weather, and a congested farm at all times.

(4) Avoid constructing buildings of too great a length. About 60 feet should be the extreme limit of a brooder house, and 14 feet is a good width. About 100 feet is the limit to which it is advisable to go in continuous roosting houses. In these, partitions at intervals will be required.

(5) Poultry houses should not be less than 6 feet high at the front, and 5 feet at the back. This height is for narrow houses. In the case of wider houses a foot higher is advisable.

(6) The ground plan of a poultry farm should be so arranged that the rearing ground for chickens shall not at any time be occupied by adult stock.

(7) A small area should be set apart for cultivation, to grow greenstuff; the balance of the land is best left undisturbed in its original condition.

Selection of Breeding Stock.

It will be found more economical to run one or two breeds than a larger number of breeds. A multiplicity of breeds entails a greater expenditure in the upkeep of the stock as well as the yarding and housing accommodation. The old idea of keeping every known breed of fowls, geese, ducks, and turkeys on one farm is a mistake. After deciding on the breed or breeds to be kept, the next thing of importance is to obtain character and physique in such breeds. It should be remembered that the tendency towards degeneracy is greater as the birds are brought under the artificial conditions incidental to poultry farming.

Weight, as indicative of development, is one of the main considerations in selecting breeding stock. As a guide to what is considered necessary in this direction, it might be stated that a—

White Leghorn cockerel should weigh at least ...	5 lb.
„ „ pullet	4 to 4½ lb.
Orpington, Black or Buff, cockerel	6 to 7 lb.
„ „ „ pullet	5 to 5½ lb.
Rhode Island Red cockerel	6 to 7½ lb.
„ „ pullet	5 to 5½ lb.

Cocks and hens, after their first moult, usually at about eighteen months, should be 1 lb. heavier in the lighter breeds and 2 lb. heavier in the other breeds than cockerels and pullets.

Successful chicken rearing is the foundation of all success in poultry farming, and this we are not likely to secure unless more attention is paid to the factors mentioned above.

The Moulting Season.

The moulting season is now coming on, and hens that it is not intended to carry over next winter should be disposed of as they go off laying. Younger hens that it is intended to keep should receive the best possible attention; hens that have been laying heavily may become run down to some extent, and the approaching moult will be a trying time for them. They might be given some assistance in the nature of a tonic. For this purpose there is, perhaps, little if anything more suitable than Douglas' mixture.

How to make Douglas' Mixture.

The method of making this is to take 4 ounces of sulphate of iron and 4 ounces of Epsom salts; dissolve in 1 gallon of boiling water; let it cool, then add half an ounce of what is sold by the chemist as dilute sulphuric acid; bottle and put away. One teaspoonful of this mixture might be added to each pint of drinking water; this might be used three or four times per week for three or four weeks at a time. Great care is necessary when handling sulphuric acid. It should only be poured slowly into the mixture, and only earthenware vessels should be used when preparing the stock mixture. No special drinking pots are necessary, for the small amount that is used in the water will not damage iron vessels to any appreciable extent. The case is different with tin-ware, such as kerosene tins, for they are readily destroyed by the use of Douglas' mixture owing to the occurrence of what are known as pin-holes in the tin.

SUPPLY OF GRAFTED VINES AND PHYLLOXERA-RESISTANT ROOTLINGS FOR 1918 SEASON'S PLANTING.

VIGNERONS are notified that they should furnish to the Under Secretary and Director, Department of Agriculture, Sydney, not later than the end of February full particulars of their requirements in the way of grafted grape vines and ungrafted phylloxera-resistant rootlings which they propose to plant in 1918. The necessity for orders being placed in advance is again emphasised, as by so doing the Department is enabled to select stocks, scions, &c., and make all arrangements to carry out grafting operations in accordance with the demand for the different varieties.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

CIRCULATION OF AGRICULTURAL LITERATURE.

AFTER consultation with the Department of Agriculture, the Principal Librarian, Sydney, has decided to establish a library for the circulation of agricultural literature amongst the various branches of the Agricultural Bureau. Several sets of about thirty books, each dealing with all departments of agriculture and allied subjects, are now available for loan to branches, and secretaries whose members desire to participate in the advantages of the circulation should make application to the Principal Librarian, Sydney.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Batlow.

The Assistant Fruit Expert, Mr. W. le Gay Brereton, gave a summer thinning demonstration on 22nd November, which was much appreciated by members.

Cotta Walla.

A most enjoyable social evening was held on 12th December to celebrate the first anniversary of the formation of the Cotta Walla branch. There were about fifty persons present; Mr. T. J. Kennedy presided. After the usual business had been transacted, refreshments were handed round. The second part of the evening included a farewell to Private G. A. Barry, the third member of the branch who has enlisted during the year. The Chairman presented Private Barry with a handsome pocket wallet and fountain pen.

The Secretary reports that interest in the Bureau is rapidly increasing, and a larger membership is expected next year.

Cunningham.

At the annual meeting the following officers were elected:—Chairman, Mr. W. J. Rolfe; Vice-Chairman, Mr. H. Hull; Hon. Secretary and Treasurer, Mr. B. J. Stocks.

Glenorie.

A meeting of the branch was held on 25th November. The greater part of the evening was devoted to a discussion of the principal difficulties in connection with the fruit-growing industry in the district. Two new members were added at this meeting.

A library is being formed for the use of members, and several important books are being procured.

A meeting was held on 30th December, when there was a general discussion on carriage and market difficulties, and the problem of fungus diseases of stone fruit. It being the last meeting of the year, a smoke social was held at the close of the meeting.

Kellyville.

A meeting was held on 6th January at which there was a fair attendance of members. A long discussion took place on the proposal to forward an exhibit from the branch to the forthcoming Castle Hill show, and the Secretary was eventually instructed to secure, if possible, the necessary stand for the exhibit.

Lidcombe.

A very successful meeting was held on 18th December, when Mr. J. Hadlington, Poultry Expert, lectured to a crowded audience. There were over thirty members present, and a very large number of the general public. The Secretary states that keen interest was shown in the lecturer's remarks, and in the slides shown. Many questions were answered by Mr. Hadlington.

Matcham.

A meeting was held on 16th December when papers on co-operation were read by Messrs. S. C. Aldridge, T. R. Michelsen, and A. E. Caldwell. These papers were subsequently discussed at a meeting held on 6th January.

Miranda.

At a meeting of this branch, held on 20th November, Mr. F. C. Sargeant addressed members on the subject of the principles of animal nutrition, dealing particularly with the question of proper feeding of poultry.

THE PRINCIPLES OF ANIMAL NUTRITION.

In the course of his remarks Mr. Sargeant referred to the analysis of vegetable foods. He stated that the percentage of mineral matter in all forms of seeds was found to be very low, although some by-products obtained in the treatment of seeds showed a much richer ash-content than the whole seed—a notable example of which was bran.

The greater proportion of the mineral elements in an animal body was found in the bones, and proper mineral content in the food at all times was essential both to proper bone formation and to the general welfare of the stock.

Mann in his treatise on the "Chemistry of the Proteins" had laid it down that protein, in the absence of mineral salts, was dead; that was to say, if the necessary mineral salts were not available the protein could not be broken down and assimilated by the system.

In feeding poultry, the mineral content of the food used was very important, as not only had the needs of the body to be met, but an egg contained a considerable portion of mineral salts (exclusive of the shell), and it was upon the presence of these salts that fertilisation depended. Milk and eggs were generally recognised to be the nearest approach to ideal foods; both these foods were rich in mineral matter, and it was not generally recognised that in the case of both the cow and the hen, if there was a deficiency of salts in the food, then the body was drawn upon for a supply. This could not continue; either the animal died or at least it ceased to produce.

Possibly in this fact lay the failure of many heavy-laying fowls to produce their characters in their offspring, a deficiency of mineral salts in the egg being essential to the proper development of the embryo. The lecturer admitted he had no direct authority for making such a statement, but it seemed to him to be a logical conclusion.

Observers had tried to keep various animals on an ash-free diet, but disturbances immediately arose and death ensued in course of time, so that the importance of a proper mineral element in the food could not be disputed.

Under free range conditions no attention need be paid to this factor, for the fowls would get all they needed for themselves, but when fowls were confined they were dependent upon the mineral content of the food supplied for their needs, and it had been asserted—and it was logical to believe—that the fact that pullets of a laying age and in every other respect fit to lay, did not lay, was very often due to the lack of these essential elements.

Young and growing stock also needed a ration rich in protein, and the same ratio as for laying hens had given the best results for growing fowls.

In conclusion, Mr. Sargeant said he knew perfectly well that thousands of poultry-keepers were making a success of poultry feeding without worrying their heads about protein, &c., but, if the truth were told, most of these successful feeders had learned by practical experience the truths that he had endeavored to make clear, and by reason of that past experience (sometimes dearly bought) they were now feeding "balanced rations." Though they knew nothing about the chemical constituents, they knew that maize by itself was too fattening, that wheat was the most satisfactory grain to use, that pollard by itself was too heavy, that meat meal added to the mash gave better egg returns, that greenstuff was good for the fowls, that the fowls liked grit, and lots of other things. But they did not know the reason for these things, and he was only too pleased if his address had contributed to a better understanding of what was meant by food values.

Mittagong.

At the annual meeting of this branch, the report showed a membership of fifty, and a credit balance of £4 8s. 6d. The election of officers resulted as follows:—Chairman, Captain Fairley; Vice-Chairman, Mr. A. J. Turner; Hon. Secretary and Treasurer, Mr. H. F. Thresher.

At recent meetings of the branch, papers and lectures have been delivered by Mr. Ferguson on "The Horse and How to Manage Him"; Mr. J. Hadlington, Poultry Expert, on "Poultry Farming"; Mr. R. N. Makin, Inspector of Agriculture, on "Potato-Growing"; and Captain Fairley on "The Orchard of the Future."

St. John's Park.

Mr. J. Secombe delivered a lecture on horticulture on 30th November. The lecturer dealt fully with the preparation of the soil, and the various methods of propagation. Mendelism and the production of new varieties were explained, and a collection of choice flowers was exhibited.

Tallawang.

In the December issue of the *Agricultural Gazette*, a paper by Mr. E. Hawdon was inadvertently attributed to Mr. E. Hinder.

Woonona.

At a meeting held on 14th December, Mr. H. Cotman continued his paper on the production of honey, dealing with swarming, hiving, comb-building, honey-gathering, and extracting, and the general management of the hive.

Mr. Fowler read a paper on poultry-keeping, dealing with the merits of the various breeds and the results of the Hawkesbury Agricultural College competitions.

On 9th January, Mr. Thos. Horan delivered a lecture to members on astronomy.

Yarramalong.

A meeting was held on 9th December at which the Government proposals in connection with the flying-fox pest were discussed. It was decided to raise a fund by voluntary subscriptions, and a committee was appointed to deal with the matter. The neighbouring branches of the Bureau are being asked to co-operate in the work.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	A. J. Alcock, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Boolaroo	J. Raw, Fairfax-st., Spier's Point.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Brocklesby	J. Hunter, Brocklesby.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	V. Gooley, Private Mail Bag, Casino.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	J. Clatworthy, Millpose, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	F. A. March, Cordeaux River, Mt. Kembla.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla.	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, *Dorrigo.*
Forest Creek	W. Thompson, Forest Creek, Frogmore.
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Hesdon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	F. J. Gifford, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne	Sylvester Kennedy, Jindabyne.
Katoomba	W. E. Parry, Victoria Road, Katoomba.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Lankey's Creek (Jingellic).	G. J. Nichols, P.O., Jingellic.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A. E. J. Anderson, B.A., Platform-street, Lidcombe.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	—
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	H. R. Parkes, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Rawsonville	—
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	D. J. Dougherty, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, Wyalong W.
Spencer	P. A. Edwards, Public School, Spencer.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Thyra-Bunaloo	C. H. M. Smith (*pro tem*), Thyra, via Moama.
Toronto	—
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Wetherill Park	L. Rainbow, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	A. Cavill, Campbell-st., Woonona.
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yass	—
Yetholme	N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca.	R. Waples, Yurrunga.

Orchard Notes.

FEBRUARY.

W. J. ALLEN.

Cultivation.

CONSTANT showers in the first half of the summer are liable to make one careless as to cultivation, but often the season dries off suddenly, and it is marvellous how quickly the ground dries out if it has not been kept clear of weeds. Every opportunity should be grasped to keep the cultivator or plough working.

Irrigation.

Where irrigation is practised, give fruit trees a watering if required. In the case of raisin grapes, avoid further watering, if possible. Late watering is liable to interfere with the ripening, whereas one wishes to hasten this so that drying may proceed while the sun still retains its summer heat. Late table grapes, however, may be much improved by a watering if the early autumn proves dry. Orchards and vineyards should both be thoroughly cultivated as soon as the land is dry enough after irrigation.

Harvesting.

The harvesting of fruit will continue during this month, and picking will start for the early shipments for export where space has been obtained. Fruit for export should be picked during the cool part of the day, so that it will come into the packing house in a cool condition. It should be carefully handled to avoid bruising. The best quality only should be forwarded. It should be evenly graded as to size and colour, neatly wrapped, and firmly packed in new, clean cases.

Drying.

Peach drying will be in full swing in our inland districts this month, and towards the end of the month the picking and drying of Zante currants, sultanas, and Gordo Blancos will commence.

Fruit Fly.

This pest has not yet become very troublesome this season, but growers must not be tempted, on this account, to be careless. They should keep all fallen fruit regularly picked up and destroyed by either boiling or burning.

Codlin Moth.

The early brood was delayed this season, but probably more grubby fruit will show up this month than is at present anticipated. Every effort should be made to pick off and destroy all infested fruit. In districts where the moth is bad, bandages should be placed around the stem of the tree. These should be regularly examined, and all larvæ destroyed.

Scale Insects.

The various scale insects on citrus trees can be treated this month by either fumigation or spraying, provided the trees are in strong condition. Avoid spraying on very hot sunny days. Fumigation should only be carried out at night.

Re-working of Trees.

If the sap is running well the present month is a good time for re-working unsuitable varieties by budding. Select the scions from trees of proven quality. Details of the methods of budding and grafting can be obtained from the Department's publication on this subject, which is at present available free of cost.

Green Manures.

This is a good month, if seasonable rains fall, to sow crops for green manuring. If a crop does not get a good start early in the autumn it will make very little growth during the winter before it is time to plough it under. Field peas, vetches, Skinless barley, rape, and rye are all used as crops for this purpose. One suitable to the district should be selected. Rye is very useful in our inland districts where the winter is more severe than in the other parts of the State. Field peas and vetches have the advantage of being leguminous and supplying nitrogen from the atmosphere to the soil when ploughed in.

Citrus trees may receive their autumn dressing of fertiliser this month.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Pambula A., H., and P. Society	M. E. Stewart	Feb. 14, 15
Central Cumberland A. and H. Assoc'n (Castle Hill)	H. A. Best	,, 16, 17
Dapto A. and H. Society	J. J. Cook	,, 21, 22
Wyong District A. Association	W. Baldwin	,, 23, 24
Gunning P., A., and I. Society	S. A. Beer	,, 27, 28
Albion Park A., H., and I. Association	J. Caldwell	,, 27, 28
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 27, 28
Dorrigo A., H., and I. Society	R. R. Blair	,, 28; March 1
Newcastle A., H., and I. Association	E. J. Dann	Feb. 28; March 1, 2, 3.
Robertson A. and H. Society	R. Graham	Mar. 1, 2
Inverell P. and A. Association	J. McIlveen	,, 1, 2, 3
Bangalow A. and I. Society	W. H. Reading	,, 6, 7
Yanco Irrigation Area A. Society	F. D. Inman	,, 6, 7
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 6, 7, 8
Tenterfield P., A., and M. Society	R. G. White	,, 6, 7, 8
Braidwood P., A., and H. Association	L. Chapman	,, 7, 8
Coramba District P., A., and H. Association	H. E. Hindmarsh	,, 7, 8
Tumut A. and P. Association	T. E. Wilkinson	,, 7, 8
Manning River A. and H Association (Taree)	L. Plummer	,, 8, 9
Crookwell A., P., and H. Society	M. P. Levy	,, 8, 9
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne	,, 8, 9, 10
Nepean District A., H., and I. Society (Penrith)	P. Smith	,, 9, 10
Queanbeyan P. and A. Association	J. G. Harris	,, 13, 14
Glen Innes & Central New England P. & A. Assoc'n	G. A. Priest	,, 13, 14, 15
Cobargo A., P., and H. Society	T. Kennelly	,, 14, 15
Gundagai P. and A. Society	A. Elworthy	,, 14, 15
Moruya A. and P. Society	H. P. Jeffery	,, 14, 15
Nambucca A. and H. Association (Macksville)	M. Wallace	,, 14, 15
Nimmitabel A. and P. Association	O. E. Silk	,, 20, 21
Quirindi District P., A, and H. Association	A. N. Pountney	,, 20, 21, 22
Armidale P., A., and H. Association	A. McArthur	,, 20, 21, 22, 23
Molong P. and A. Association	W. J. Windred	Abandoned.
Delegate P. and A. Association	F. Mullaney	,, 21
Moruya A. and P. Society	H. P. Jeffery	,, 21, 22
Camden A., H., and I. Society	A. E. Baldock	,, 21, 22, 23
Batlow A. Society	C. S. Gregory	,, 27, 28
Blayney A. and P. Association	E. F. Simmons	,, 27, 28
Tamworth P. and A. Association	J. R. Wood	,, 27, 28, 29
Walcha P. and A. Association	J. N. Campbell	,, 28, 29
Cooma P. and A. Association	C. J. Walmsley	,, 28, 29
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 28, 29, 30
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 28, 29, 30
Royal Agricultural Society of N.S.W.	H. M. Somer	April 3-11
Clarence P. and A. Society (Grafton)	G. N. Small	,, 18, 19, 20
Orange A. and P. Association	W. J. I. Nancarrow	,, 18, 19, 20
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 18-21
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 25, 26
Lower Clarence A. Society (Maclean)	K. McKay	,, 25, 26
Dungog A. and H. Association	C. G. Grant	May 2, 3
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 3, 4, 5
Kyogle P., A., and H. Society	D. Campbell	,, 9, 10
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 21, 22, 23

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Agricultural Gazette of New South Wales.

Progress in Maize Improvement.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE work of maize improvement that has been undertaken by this Department during the past few years has as its main object the improvement of varieties in purity and yielding capacity, with, of course, the ultimate intention that pure, well-bred seed of the different varieties used in the State shall be supplied to farmers, and the quality and yield of our maize crops thereby enhanced. The results of this work, which was commenced in 1914, have been related in some detail in the annual reports of the Department of Agriculture, but it is felt that the time is opportune to present some account of the work to farmers, per medium of the *Agricultural Gazette.*

Maize differs from most other crops in that it is readily cross-fertilised, and the initial work of breeding or selecting for improvement consists largely of eliminating the impurities represented by previous crossing with other varieties, and at the same time conducting accurate tests to ensure the maintenance or increase of the yielding capacity. This is done by means of "ear-to-row" tests, in which separate rows of equal length in a uniform plot are planted with grain from individual selected ears, the rows being 2 or 3 chains in length. Only one-quarter or one-third of the grain from the ear is used to plant these rows, and the residue from each ear is carefully kept separate until the following year. The produce from these rows is weighed and examined for purity and type, and the highest yielding rows of good and pure type are determined. The residue of the grain from the ears corresponding to the best rows is sown the following year in an isolated "breeding plot," so that fertilisation in this plot takes place only between strains of proved high-yielding capacity. Seed from this breeding plot is then selected to plant a larger or field area. In the meantime the ear-row test is continued each year with ears selected from the previous year's test plot, and fresh seed is made available for the breeding plot and the field crop every year.

At each experiment farm where these tests are carried out, only one variety of maize is being grown, and the variety selected is, as far as possible, that which is most suited to the climatic and soil conditions of the district in which the farm is situated. At Grafton Experiment Farm, owing to the longer growing season, and to the demand in the district for an early as well as a late variety, two varieties are grown, but they are prevented from intercrossing by planting one early and the other late. In view of the considerable advantage which acclimatised seed possesses over unacclimatised seed, this practice of growing on the experiment farm that variety which is best adapted to the district is a boon to farmers who wish to obtain pure seed maize.

New and introduced varieties are tested from time to time against the acclimated varieties on the farmers' experiment plots conducted by the inspectors of agriculture in different localities throughout the State.

It is unfortunate that the experiment farms of the State do not represent every district in which maize is grown. At present the districts not so represented are the South-western Slopes (Tumut), North-western Slopes (Tamworth and Inverell), and perhaps part of the Southern Tableland. This difficulty is being surmounted, however, by finding reliable farmers who are undertaking to grow pure seed maize, suitable for the district, under the supervision of the Department.

In the ear-row tests at the various farms detailed notes are taken on the types of ears planted, in order to fix the best yielding types for the purpose of identification of the variety and to discover, if possible, any correlations between ear characters and yield which would be of value in selection. These notes include weight, shape, length and circumference of ear, indentation of grain, number of rows, tip filling, husk protection, rounding of butt, size of shank, space between rows and grain, colour of core, thickness, breadth, and depth of grain, colour of grain, size of cap, size of germ, weight and percentage of shelled grain per ear, shape of grain, number of grains per ounce, and uniformity of grain in colour and shape.

At Grafton, Hawkesbury Agricultural College, and Glen Innes, the following notes are also taken on the field characters at the time of selection:—Space in which the plant is growing, thickness of stalk, number of brace roots, number of suckers, number of ears per stalk, height of ear on the stalk, erectness of ear at maturity, covering afforded by the husk and the tightness with which it envelops the ear, coarseness of husk bracts, presence or absence of leafy appendages on the husk, length of shank, abundance of foliage, relative maturity to rest of crop, height of stalk, abundance of tassel, and pests or diseases. It is expected that from these notes some correlations between field characters and yield will be obtained from which some definite information can be given on field selection—a practice which does not receive the attention it merits from maize-growers.

During the growth of the plot the following notes are taken on the individual rows:—Germination, foliage, dates and periods of tasselling and silking, suckering, barren plants, average height of stalk, average height of ear, average length of shank, average number of ears per stalk, erectness of ear at maturity, husk protection, weakness of stalk and lodging, period of maturity, and insect pests or fungus diseases.

The outstanding feature of the ear-row tests at the various farms has been the variation in yield between the different rows. In nearly every test conducted so far, the highest yielding row has produced more than twice as much as the lowest. This is an indication of what improvement it is possible to effect in yield by this method of selection on "performance."

Another noticeable feature of considerable value is that some of the best yielding rows have been found to be almost uniform in type. The residue of the ears corresponding to these rows constitute a valuable basis for breeding the variety up to a high standard of purity and yielding capacity.

Leaming.

This variety, which is being grown at Grafton Experiment Farm, is becoming extremely popular for early sowing on the North Coast, owing to its ability to withstand the dry spring seasons, which are so common in that portion of the State. The seed-plots at Grafton are sown in November or December, owing partly to the greater ease with which seed from such planting can be kept free from weevil, and partly also to the risk of failure from earlier sowings.

In 1914–15 the seed plot of this variety averaged 48·8 bushels per acre, while the average of the best ten ears was 58·4 bushels. The highest yielding row gave 70·2 bushels, and the lowest 26·7 bushels per acre. Field selected seed yielded 52·1 bushels per acre; barn selected seed 45·5.

In 1915–16 the plot yielded 71·4 bushels per acre on 18½ inches of rainfall. The highest-yielding row gave 87·3 bushels per acre, and the lowest 59·4 bushels. The best ten rows averaged 80·4 bushels per acre, giving an increase of 9 bushels over the average of the plot.

A study of the yielding capacity of ears selected from high-yielding rows of the previous test gave the following results :—

Yield, 1914-15.	Corresponding Yield, 1915-16.
Over 65 bushels per acre.	87 bushels per acre.
60–65 „ „	72 „ „
55–60 „ „	71 „ „

No advantage has been derived from selecting for two ears per stalk, and ears from stalks which are thick at the base have yielded better on the average than those from thin stalks. Ears selected from plants with suckers, especially if the latter also bore small ears, almost invariably yielded higher in 1914–15 than ears from suckerless stalks, while practically no difference between the two was observed in 1915–16. This at any rate seems to disprove the oft-quoted theory of universally selecting seed ears in the field from suckerless stalks. It must be borne in mind that Leaming is a variety which naturally suckers freely on fertile soil, and it would seem that there is nothing to be gained by departing from the suckering habit.

Ears drooping at maturity have consistently outyielded those erect at maturity.

It has been observed that ears which are well covered by a husk which fits tightly over the ear are always free from weevil in the field, and this is a valuable point of selection in this variety especially as, being usually sown early, the weevil infests the ears in the field before harvesting.

Ears selected at a height of 5 to 5½ feet on the stalk have yielded better than higher and lower ears.

The percentage of suckers in the different rows in 1915–16 varied from 40 to 180, but the yields of the rows did not bear any direct relation to these figures.

Throughout this variety a medium red colour of grain is still evident, but care is being taken not to allow this to become too pronounced, or the red so dark as to cause a diminution in the market price. At the same time, the relation between medium red colour and good type of ear still seems to continue, and there is some demand for seed of this type.

There is also still a trace of crossing with a later Yellow Dent variety, but this is being largely eliminated by rigorous field selection for early maturity.

The type which is proving of highest yielding capacity is slightly different from the original Leaming, in that it possesses a much deeper grain, a higher shelling percentage, and a slightly larger core. It is natural to expect a change in these characters in the directions indicated under North Coast conditions.

The smooth dent has given increased yields over the rough type in this variety.

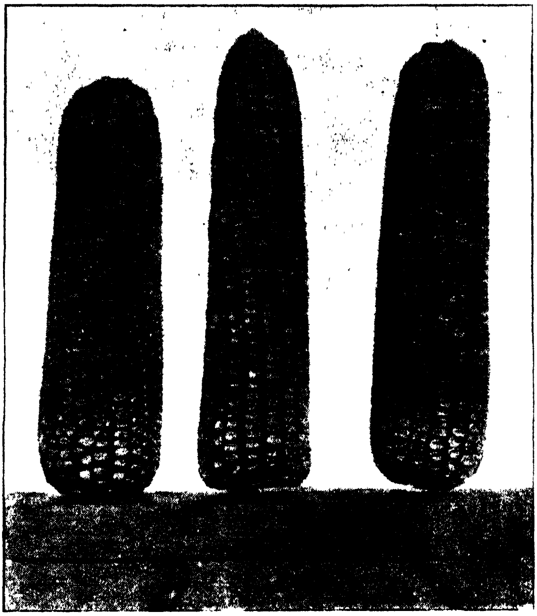


Fig. 1.—Original type of Leaming in centre with the improved type on either side. The latter is being selected as a higher-yielding type for North Coast conditions.

Better yields have also been obtained from ears with 20 or 22 rows of grain than from broader types of grain with a smaller number of rows per ear.

Improved Yellow Dent.

This is a very popular variety for both grain and fodder on the North Coast, and its improvement is also being carried out at Grafton Experiment Farm.

In 1914–15 the seed plot averaged 47 bushels per acre, and the best ten rows 56·2 bushels. The highest yielding row gave 64·4 bushels per acre, and the lowest 32·4 bushels.

In 1915–16 planting was delayed until January owing to the severe drought, which lasted until December. The best row yielded 86·5 bushels per acre, and the poorest 40·0 bushels. The best ten rows averaged 79·3 bushels per acre, an increase of 9·3 bushels over the average of the plot.

This variety had already been appreciably improved by Mr. A. H. Haywood when manager of Grafton Experiment Farm. His work had been more particularly in the direction of resistance (by complete husk protection) to wet weather such as is likely to occur in early autumn on the North Coast. There is still, however, a slight defect in this respect, viz., the erectness of the ears at maturity, and this can only be eliminated by one method—field selection.

Ears from high yielding rows in the ear-row test have given an average of 13 per cent higher yield than seed from rows of medium yield. The highest yields have been obtained from ears selected from stalks of short or medium height. This correlation is of much importance in this variety, as the stalk is very prone to grow too tall, especially with late planting on the North Coast. Ears selected from very tall stalks have given lower yields in almost every case. Ears placed low (*i.e.*, comparatively) on the stalk have also given distinctly higher yields than high ears. Ears drooping at maturity have yielded 9 per cent. higher than erect ears. Ears selected for medium to late maturity gave an increase of 10 bushels per acre over early maturing ears. Ears selected from suckerless stalks gave an increased yield of 5 bushels per acre over ears from sucker-bearing stalks. This variety does not sucker as freely as Leaming.

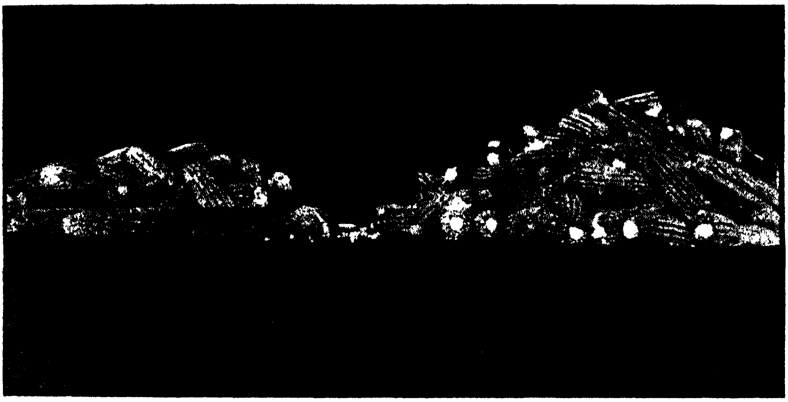


Fig. 2.—The yields from adjacent rows in the ear-row test with Improved Yellow Dent at Grafton, 1915–16, showing the difference between the yielding power of selected ears within the variety.

One of the rows in the seed plot of 1915–16 was observed to contain about 5 per cent. "albino" (*i.e.*, without any trace of green colour) seedlings soon after germination, and at harvest this was one of the poorest yielding rows in the plot. This is distinct evidence of the difference in hereditary character which is brought out by the ear-row test. Albino seedlings are generally supposed to be the result of lack of vigour, possibly due to fertilisation between parents too closely related.

The poorest yielding row in this plot had 30 per cent. barren plants, which observation at flowering time showed to be due mostly to lack of uniformity in flowering.

The colour of grain in this variety is being gradually improved. It formerly possessed a large number of ears with grain of rather poor, dull yellow colour, but this undesirable character has been largely eliminated. There are many pale-coloured or white-capped yellow varieties grown on the Clarence River, which yield well in good seasons, but which usually bring from 3d. to 6d. per bushel less than Improved Yellow Dent.

There seems to be also a correlation between a larger number of rows of grain on the ear than 18 and lower yielding capacity in this variety.

Very large ears do not appear to be a characteristic of this variety, but they have a high shelling percentage that is very little behind that of Leaming, which has such a good reputation in this respect. When it is recognised that the core is likely to grow thicker under the North Coast conditions of good rainfall, a shelling percentage of 85 per cent. must be considered very good for a late variety.

Red Hogan.

This variety is being grown on the River Farm at Hawkesbury Agricultural College. It is largely grown in the Hawkesbury district, to which it is thoroughly acclimated.

In 1914–15, the ear-row plot averaged 46·0 bushels per acre. The highest yielding row gave 72·4 bushels per acre, and the lowest 31·3 bushels. The best ten rows gave 60·9 bushels per acre. Introduced seed yielded 39·1 bushels per acre, while College-grown seed gave 50·2 bushels.

In 1915–16, the seed plot averaged 55·3 bushels per acre on a rainfall of 8½ inches. The highest yielding row gave 67·3 bushels per acre, and the lowest 41·1 bushels. The average of seed ears selected from the previous year's test plot gave 55·9 bushels per acre, and seed from the farm plots 53·6 bushels. The ten best yielding rows gave 62·4 bushels per acre, an increase of 7·1 bushels over the average of the plot.

A noticeable improvement has already been effected, by rigid selection for type, in the uniformity of colour of grain, but this selection requires to be rigidly maintained, in order that it may not go back. The true type is a rather broad thick grain, of medium red colour, and of bright attractive appearance.

Selection for brightness of colour has been strongly emphasised, for this character is associated not only with higher bushel weight but with better feeding value.

There is still a good deal of variation in colour and type in this variety. It requires to be freed from a type of very dark red grain, which is not liked on the market, and also from a dull brownish colour and a dull pale red, both of which are usually associated with softness of grain and a very low bushel weight.

There is considerable demand from Sydney seedsmen for this variety, which is known as Large Red Hogan, or Red Yankee, to distinguish it from Small Red Hogan, which is a type somewhat similar to a red strain of Leaming, except that it has not the bright attractive appearance of the latter.

Red Hogan is a very late variety, taking nearly seven months to mature in most seasons. It does not sucker very much even on fertile soil, and, unlike many other varieties, has very few barren stalks in a normal stand.

An early sown crop on the River Farm at the College in 1915-16 yielded 50 bushels per acre on less than 4½ inches of rain during growth.

Early Yellow Dent.

This variety is grown at Glen Innes Experiment Farm, and is becoming increasingly popular in the district and throughout the Northern Tableland, where it is valued on account of its earliness.

In 1914-15 the plot average was not good, owing to its being sown on low-lying ground, where excessive rain fell in the early stages. The highest and lowest yielding rows gave 33·7 and 15·1 bushels per acre respectively.

In 1915-16 the stand was somewhat thin owing to continued dry weather in the early part of the season, but in spite of this the plot averaged 37·4 bushels per acre. The highest yielding row was much ahead of any other row in the plot, giving 59·9 bushels per acre, while the next best was 49·3 bushels. The lowest yielding row gave 24·3 bushels per acre, and the best ten rows 44·4 bushels—an increase of 7 bushels over the average of the plot. The rainfall during growth was 795 points.

This variety varies rather much in its period of maturity, some plants being ripe about three weeks before others. This defect, however, is likely to be remedied by vigorous field selection.

The type of ear and grain are also lacking somewhat in uniformity, but this has been improved greatly during the past two years by very strict selection to type.

Boone County White.

This variety is a favourite on the South Coast, and the improvement work with it is carried out at Berry Experiment Farm. The soil here is somewhat poor and badly drained, but it responds very readily to manure.

In 1914-15 the seed plot turned out very poorly owing to excessive rain during the early stages of growth. The best row gave 40 bushels per acre, and the poorest 15·8.

In 1915-16 the rainfall was 1,371 points during growth, rather less than normal. The average yield of the plot was 45 bushels per acre, while the highest and lowest yielding rows gave 61 and 34·3 bushels per acre respectively. The best ten rows averaged 53 bushels, an increase of 8 bushels per acre over the plot average.

This plot has afforded some very interesting results on the effect of adaptation upon yield. Some seed ears were harvested from the poor yielding seed plot of the previous year. These were rather poor ears for seed, but it was thought that they would have an advantage owing to their having become acclimated and adapted to the particular soil conditions at this farm. Against these there were tested some very fine showy ears obtained from Kangaroo Valley from good fertile soil. The average length and weight of the two sets of ears, together with the respective yields, were as follows:—

Source of Seed Ears.	Average Length of Seed Ears.	Average Weight of Seed Ears.	Yield per Acre.
	inches.	oz.	bushels.
Berry (acclimated)	8·9	13·2	52·9
Kangaroo Valley (unacclimated) ...	9·2	14·4	43·5

Although the unacclimated seed ears were superior in every way to the locally-selected ears, the latter gave an increase of 9·4 bushels per acre. This large increase is probably due mostly to the marked peculiarity of the Berry Farm soil as compared with other maize soils. It points strongly to the fact, however, that not only should seed maize be adapted to the climatic conditions if the best results are to be obtained, but it should also be adapted to soil conditions.

Gold Standard Leaming.

This variety is being improved by the system of ear-row testing at the farm of Mr. G. Lindsay, Dapto. In 1915–16, with a rainfall of 699 points during growth, the plot averaged 61·6 bushels per acre. The highest and lowest yielding rows gave 81 and 44·2 bushels per acre respectively. The best ten rows averaged 68·5 bushels per acre, an increase of 6·9 bushels over the average yield of the plot.

This variety is considered by Mr. Lindsay as admirable for his purpose in providing a good picking of seed before chaffing the stalks for silage or fodder, and in being very suitable also for this latter purpose, on account of its fine succulent stems. It is somewhat similar to the well-known Leaming in growth, but is slightly earlier and has broader grain with a smaller number of rows on the ear.

Acclimated seed gave a yield of 65 bushels per acre, while seed from type ears from America gave 61 bushels.

Reid's Yellow Dent.

This variety was grown last season on the alluvial soil at Bathurst Experiment Farm under irrigation. Some fine ears were obtained, up to 11 inches in length. This is a very fine show maize, with almost perfect show ears, but it requires good conditions for growth. It is a comparatively new variety in this State, but has been given a considerable amount of attention by improvement in the United States of America.

It is a suitable variety for the rich river flats on the Western Slopes especially where irrigation can be practised. It has also done well on parts of the South Coast.

Silvermine.

This variety was imported from America last season and grown at Yanco Experiment Farm under irrigation, where it gives promise of being suited to the climatic conditions owing to its small leaf area and good proportion of ear to the amount of stalk grown. Its earliness is also a valuable character in view of the experience that December is the best average planting month on the irrigation area.

It is not a new variety to the State, having been grown here some years ago, when it gave good results on the Western Slopes, but it had not been grown at any of the Experiment Farms during the past few years, and what seed of it could be obtained from other sources was not very pure or true to type. Hence the necessity for seed being obtained from America as stated above.

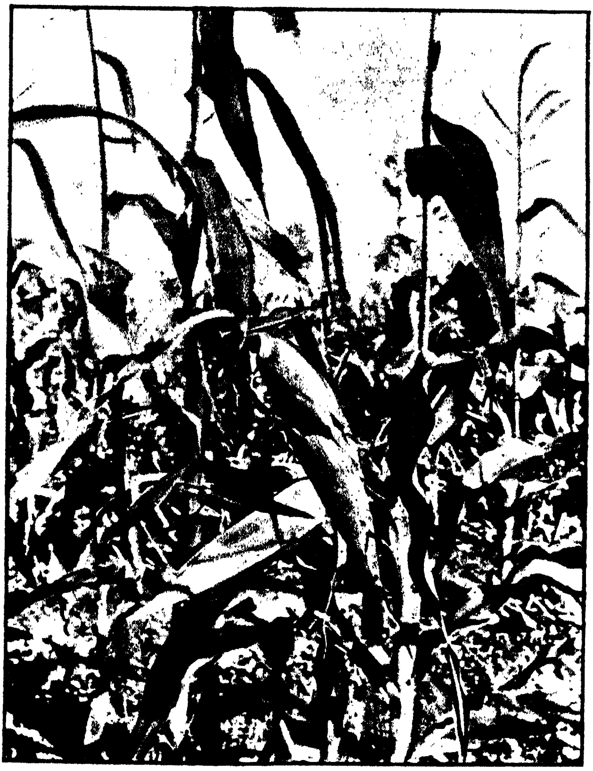


Fig. 8.—Silvermine at Yanco Experiment Farm showing the large size of ear for the amount of stalk grown.

It is a white variety, which has a reputation for doing well on poor soil or under dry climatic conditions, and it is intended to continue growing it at Yanco Experiment Farm, adapting it by systematic selection to the local conditions. The prejudice against white maize which existed some years ago, and which partly relegated this variety to the background, has considerably disappeared of late years, and Silvermine is likely to become one of the most popular varieties in certain districts.

It is grown to some extent on the Northern Tableland, especially on the lighter granite soils, and also on the far South Coast.

Funk's Yellow Dent.

This is a variety which is coming to the fore as a drought-resister. It has given particularly good results in the Inverell district, and it is being improved by the ear-row system at the farm of Mr. J. Ditzell, Inverell.

This maize is also coming into favour for early sowing on the South Coast, where it takes the place that Leaming now occupies on the North Coast, viz., for the early sowing of small areas.

It is one of the most suitable varieties for the dry conditions of the Western Slopes.

Hickory King.

Seed of this variety was raised last season at Wollongbar Experiment Farm and on the "poor land" plots at Grafton Experiment Farm. On the latter, up to 25 bushels per acre were obtained with the addition of manure. Considerable improvement may be effected in this variety by eliminating the irregular rowed type of ear, and the husk covering is open to much improvement by field selection, as on the coast late autumn rains cause mould and ear-rot. Many ears in this variety have a rough type of dent and in many cases this is associated with deeper grain, but in some cases with pinched grain.

It is, *par excellence,* the best variety for poor land on the coast.

Natal White.

This is a large, white-grained variety, which was imported from South Africa last season, and which was given a preliminary trial at Wollongbar Experiment Farm. It is a rather late variety and gives promise of being suitable for the far North Coast, which has somewhat similar climatic conditions to the coast of Natal, where it is grown.

It requires improvement in the hardness of the grain—which is possible by selection—as it is somewhat inclined to be soft.

Crossbreds.

In view of the field for improvement within the variety that is opened up by the ear-row system, and because it is the nature of maize to be easily cross-fertilised, the evolution of new varieties by cross-breeding is not likely to be of much importance except in special cases.

An accidental cross between Hickory King and Boone County White was discovered at Yanco, in 1914, and is being persevered with in a type which has the small core and hard, medium-large grain of Hickory King, but without the rounded grain and the large spaces between the rows of that variety, having in place of these characters the deep wedge-shape grain of

Boone County White. This crossbred was tried at Bathurst Experiment Farm on the upland last season, but owing to its lateness for this district, and the long time necessary to make it earlier by selection alone, it is being still further crossed on to Silvermine, which is much earlier. The original cross is now being grown at Wollongbar, in place of Hickory King.

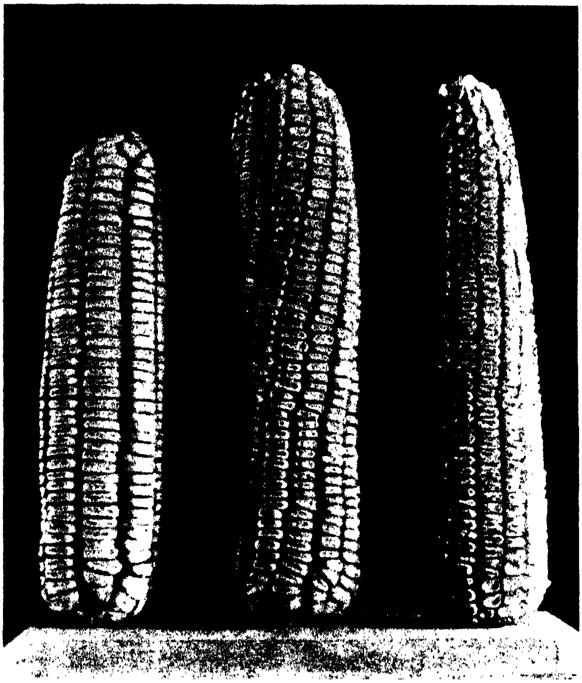


Fig. 4.—Hickory King x Boone County White crossbred (in centre) with parents Hickory King on left and Boone County White on right.

The increased vigour shown by crossbreds in the first generation entitles the question of raising of crossbred seed to some consideration. The crossbred Little Hogan x Improved Yellow Dent, which was raised at Grafton in 1913, was tested in 1914–15 against Improved Yellow Dent on farmers' plots in different localities, and on different classes of soil on the North Coast, with the following results :—

Locality.	Soil.	Yield of Crossbred.	Yield of Parent.
		bus. lb.	bus. lb.
Sherwood	Poor	54 24	44 26
Upper Orara ...	Poor	62 44	61 43
Mondrook	Fertile ...	77 8	81 12

Funk's Yellow Dent x Leaming is a crossbred which was raised last season at Grafton Experiment Farm ; it is being tested this season as a first generation crossbred against both parents.

Lime on the Farm.

[Continued from page 7.]

F. B. GUTHRIE.

A PLEA FOR CHEAPER FREIGHTS FOR FARMERS' LIME.

In the foregoing series of articles an attempt has been made to show the great variety of ways in which lime is useful to the farmer. In addition to its use as a soil ameliorant on stiff or sour soils, and as a direct plant food in the case of many crops, it is used in combating insect and fungus pests, as an ingredient in the compost heap, for softening the water supply, and in making wash for coating the wooden or iron floors, walls and ceilings of farm buildings. It is also used as an auxiliary to the diet in the case of poultry, and as an ingredient of licks for cattle. In view of its extended use, the farmer has a fair claim to ask for some greater concessions in the matter of freight of lime used for agricultural purposes than he now possesses.

At present, owing to the high price of both quicklime and agricultural lime, and the high freights ruling, the application of lime to the soil in the quantities required to be of benefit becomes prohibitive in the matter of cost.

The local quotations for lime are as follows:—

Building Lime	£3 per ton Sydney. £2 per ton Portland.
Agricultural Lime ...	£1 10s. per ton Sydney. £1 per ton Portland.

There is, however, a very limited supply of agricultural lime.

"Agricultural Lime" is carried on the railways at the same rate as artificial manures. For example, for 100 miles, the freight for ton lots is 5s. 2d. per ton. This rate is an increase on the rate ruling last year, which was 3s. 7d. The trouble, however, is that agricultural lime is not obtainable in any quantity, nor is it suitable in many cases for which lime is required (as will have been seen in previous articles on "Lime on the Farm"), and the farmer has to obtain burnt-lime or building lime, which is not only much dearer but is charged a very much higher freight. Thus for 100 miles the freight for burnt-lime is £1 2s. 10d. per ton in ton lots; 14s. 4d. per ton in 4-ton lots; and 9s. 10d. per ton in 8-ton lots. So that a single ton of lime delivered on a farm in, say, the Maitland or Nowra district, would cost £4 2s. 10d. If agricultural lime can be obtained, and is suitable, the cost would be £1 15s. 2d. per ton.

Even in 8-ton trucks the cost would be £27 18s. 6d. per truck for burnt lime, or at the rate of nearly £3 10s. per ton. As the smallest dressing which is effective is half ton per acre, it will be seen that this additional expense per acre makes its use in many cases prohibitive.

Regulations re Carriage of Lime in New Zealand.

New Zealand has the most generous scale of freight for lime. According to an article published by Mr. W. D. Hunt in a recent number of the *New Zealand Journal of Agriculture*, lime is carried free of cost for distances not exceeding 100 miles of the kiln.

In the Southland and Otago districts, burnt lime (so-called "shell lime") costs 15s. per ton in bulk on trucks. Ground lime, which is burnt or shell lime, finely ground, costs £1 per ton. Sacks are charged for, and allowed for if returned, with a reduction of about 2d. each. So that in the district referred to, a farmer living 100 miles from a kiln would pay about 17s. per ton for the same product that our Maitland farmer would pay £3 10s. per ton for in 8-ton trucks, or over £4 in single ton lots.

For the same product, finely ground, he would pay 22s. per ton at the most.

No quotation is given for the product locally known as "agricultural lime."

Regulations in other States.

Victoria.—Mr. Rankin Scott, Chemist, Department of Agriculture, Melbourne, informs me that lime, if declared to be for agricultural purposes, is carried at manure rates. These rates, and probably the original cost of the lime, are about the same as in New South Wales. The Victorian farmer has the advantage apparently that he can obtain stone or quicklime at the lower rate, provided that it is intended for agricultural purposes.

Queensland.—The Queensland Railway Department has a special reduced rate for limestone screenings for agricultural purposes for any distance over 25 miles, which amounts to between ½d. to ¾d. per ton per mile for the truckload. In the case under discussion of a farmer 100 miles from the source of supply, this would be about 6s. per ton. The lime itself would, however, appear to be cheaper in Queensland. Mr. Brünnich, Chemist, Department of Agriculture, Brisbane, quotes £2 10s. per ton for crushed lime, and 7s. 6d. per ton for screened lime (our "Agricultural Lime") at Marmor, North Coast line.

South Australia.—I am indebted to the Director of Chemistry, South Australia (Mr. W. A. Hargreaves), for the following information with regard to the freights in that State :—

Lime, carbonate of lime, lime and hair (tanner's refuse) and nitrate of lime are carried at manure rates if the consignment note specifies that it is to be used solely for manuring land. The charge per ton for 100 miles under this rate is 6s. 3d., which is higher than our rate for agricultural lime, but lower than ours in the case of stone or quicklime. If not consigned for manuring land, stone-lime is carried under A rate, which is 11s. 6d. per ton for 100 miles as against £1 2s. 10d. in New South Wales.

Tasmania.—In Tasmania a concession is made in the freight on lime to be applied to the land which amounts to ½d. per ton per mile, the minimum charge to be not less than 7s. 6d. per truck. The applicant fills in a form stating the area of his farm and of the portion which it is proposed to lime, whether the soil is heavy or light, well or badly drained, and the crops which it is proposed to grow. As the minimum charge is 7s. 6d., this amount would have to be paid in the case of carrying a single ton for 100 miles, as against 5s. 2d. in New South Wales. Four tons would, however, be carried this distance for 13s. 4d. (or 3s. 4d. per ton) as against 20s. 8d. here. Moreover, this concession applies to stone-lime; 4 tons stone-lime would cost the New South Wales farmer in freight, £2 17s. 4d., or 14s. 4d. per ton.

For the above information I am indebted to the Acting Director of Agriculture, Hobart.

Western Australia.—The freight-charges for farmers' lime are considerably lower in Western Australia than in the other States of the Commonwealth. Professor Paterson advises us that lime, if declared for agricultural use, is carried in bags at the same rate as fertilisers. This rate is ¼d. per ton per mile for not less than 5-ton lots, with a minimum charge of 1s. 3d. per ton.

A farmer living 100 miles from the source of supply would therefore pay 10s. 5d. in freight on 5 tons, or at the low rate of 2s. 1d. per ton.

Comparing the cost of carriage in the different States of the Commonwealth it will be seen that in States like Queensland and Tasmania, where a charge of ½d. per ton per mile is made, the cost for a single ton is higher than in New South Wales, but in the case of consignments of 4 tons, or over, the cost is very much lower. The freight in South Australia is higher than is our rate for agricultural lime, but stone or quick-lime can be carried at the lower rate, provided it is to be used on the land. The same applies to Victoria, where the rates for agricultural lime are similar to our own. In Queensland the concession is only made (as with us) in the case of limestone screenings for agricultural purposes.

With the exception of Queensland and New South Wales, the other States make concessions to the farmer for stone-lime or burnt lime, provided it is to be used for agricultural purposes.

If we cannot follow the example of New Zealand, where there is practically no freight charge for lime in any form, it would undoubtedly be of very great benefit to the farmer if the present concession for agricultural lime (of which only small quantities are available) were to be extended to stone-lime or any form of lime, provided it were used for agricultural purposes. It should be possible to make this concession even greater than it now is. With the greater demand for lime which would be the result of such reduction in freight, a number of local deposits in different parts of the State, which are now unused, would be worked to the great improvement of the fertility of our farm lands. At present the tendency is to increase the freight on agricultural lime.

A Suggested Rotation for the New England District.

R. H. GENNYS, Manager, Glen Innes Experiment Farm.

IN order to secure the maximum of profit from any particular area with a minimum of labour, and at the same time to maintain the fertility of the soil without expensive manuring, some system of crop rotation is essential the wide world over. Despite the richness of the virgin soils of our own State there must come a time when the available plant food is so seriously depleted that cultivation becomes risky, if not absolutely unprofitable.

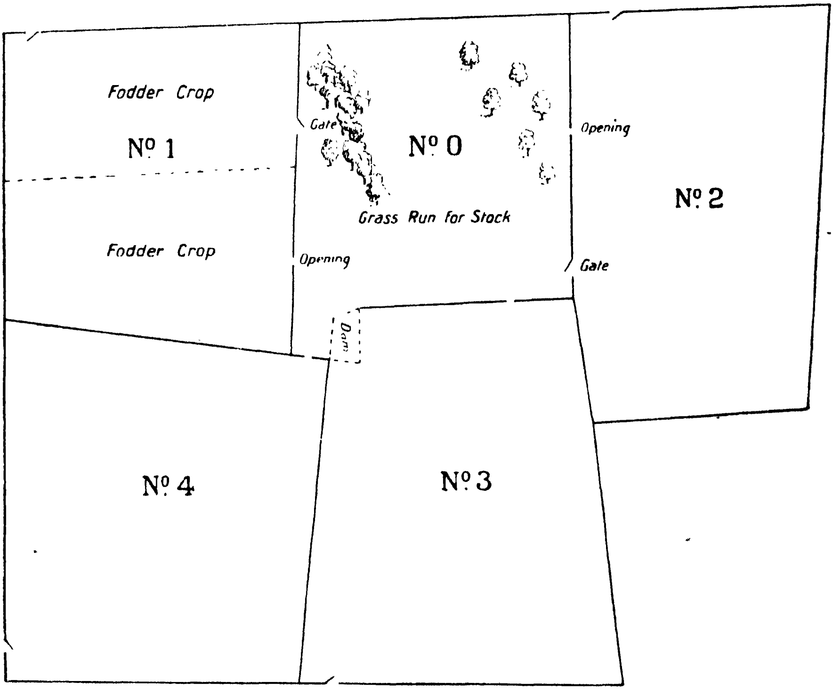
With wheat farmers in the Riverina district and on the slopes—south-western, central, and north-western—soil moisture is usually the limiting factor, and the farmer has to consider its conservation as a primary objective. Thus, a long fallow may have to take the place of an alternate crop.

But the New England district, with its usually well-distributed rainfall, its comparatively low rate of evaporation, and its retentive soil, suffers less from this disadvantage than most parts of New South Wales, and hence profitable crops may be grown more frequently without running undue risk. One good reason for some well-considered scheme of rotation in such a district may be found in the desirability of so varying the crops grown that "all the eggs may not be in one basket." If the main crop fails through climatic or other untoward conditions, another, which has met with more favourable weather, may even up matters.

Among the many questions discussed at a recent inquiry in this State was the cost of producing a bushel of wheat, and it was remarkable how wide a divergence existed between the various estimates supplied. Whatever the cost may be in each case, there are often means by which that cost may be reduced. Many agriculturists consider that this may best be brought about by increasing the area under cultivation, but they fail to realise that it is not profitable to farm a large area in such a manner that the yields secured barely pay for the cost of production. In contrast to this is the intensive method, and the surer way to secure a more stable profit is by increasing the yield. This may be done, as many writers have emphasised, by making the soil more productive through the growing of leguminous crops such as lucerne or clover, through the keeping of live stock, by systematic crop rotation, through better cultivation, and by the use of more suitable varieties, and a better quality of seed. Every farmer must sooner or later realise that there is a minimum yield, no matter the district, below which crop production is unprofitable, and that any increase upon this minimum enhances the percentage of profit. Many of the "overhead" charges, such as rent or interest, taxes, &c., are the same, whether the yield be high or low, and thus any treatment the land receives which increases the yield is worthy of the fullest consideration.

The New England tableland, as the result of demonstrations at the Glen Innes Experiment Farm and on the many farmers' experiment plots within the district, has been proved to be well suited to the production of oats, maize, and potatoes, while wheat for hay, and even for grain, is at times very profitable. Sheep are known to thrive exceedingly well. These then are the lines on which attention must be focussed.

One aspect of the problem must receive consideration. In the rotation suggested in these notes, one crop in every four is intended to be eaten off by sheep. This presupposes that the area is subdivided in such a way that water is available in all the paddocks, or is otherwise readily accessible. At the Glen Innes Farm the paddocks have been so arranged that the dam is centrally situated, practically at a corner common to the four cultivation paddocks, and with a shelter paddock of about 100 acres also available. This contains a shelter belt of red-gum saplings, and also acts as a catchment slope for the dam. These two desiderata, ample water and shelter, will very considerably conduce to the success of the whole scheme.



Plan showing the arrangement of Rotation Paddocks at the Glen Innes Experiment Farm.

The diagram (not drawn to scale) will show more clearly how the paddocks have been laid out, but, of course, the general shape of the farm and the conformation of the land may alter the positions of the paddocks and the access to water. On the average farm the grass paddock might easily be the most suitable site for the homestead, and this would be a very convenient arrangement.

The essentials to the scheme, therefore, are :—

1. Four cultivation paddocks of approximately equal area.
2. A further area, not necessarily suitable for cultivation, for use as a shelter run for the sheep when the other paddocks are not available.
3. An ample and conveniently situated water supply.
4. A flock of sheep proportionate to the size of the holding.

The rotation suggested is a four-course one, and will cover a period of four years, but allows for a bare fallow of several months if found necessary for the destruction of weeds, &c. Paddock No. 1 is laid down for one year, about February, with fodder crops for sheep which, for New England, may consist of plots of the various straw crops, rape, field peas, clover, and Italian rye grass or turnips. The paddock should be divided into two or more portions, so that one may be eaten down and then allowed to shoot again while the others are being used. The temporary fence in use at the farm is easily removed and re-erected. It will be necessary so to arrange the planting that the ration for the sheep may be as well balanced as possible. The residues of the crops should be ploughed in when the sheep have been removed.

Paddock No. 2 may be sown with late-maturing straw crops such as Algerian oats (which, although not a very long-maturing variety, have been found to do better when sown early, and are, therefore, included here), Haynes' Blue-stem wheat or Genoa wheat. The sowing of these oats and wheats should be made in April or May, and harvested, say, in December. The land can then be ploughed, and a short bare fallow is possible before the land is planted with maize or potatoes in spring.

Paddock No. 3 may be sown with maize in October and potatoes in October or November. For the former Early Yellow Dent is grown on the Farm. It is early in maturing, an essential point, as it is necessary that it should ripen in the short season between frosts, and also that a straw crop may follow immediately after it is off. As regards potatoes, for early kinds Up-to-date or Satisfaction are suitable, while for the main crop, Surprise, Queen of the Valley, and Coronation may be used. The maize and potatoes should be harvested in June.

Paddock No. 4 may receive one ploughing immediately the maize and potatoes are off, and early maturing straw crops sown, such as Sunrise and Guyra oats and Florence wheat. These may be seeded in July or August, and even as late as September. Visitors from coastal areas often exhibit surprise when they see such crops being sown in the New England district at the same time as similar crops are being cut for hay in their own locality.

It may be mentioned that when conducting mixed farming under such conditions as are here outlined, it is desirable to locate the straw stacks near the edge of the grass and shelter paddock, so that they may be readily available for the sheep in times of scarcity, and also to balance the too succulent growth in the young fodder crops.

While the system suggested provides for the return of vegetable matter and animal excreta for the formation of humus, it is not advisable to abandon the use of phosphatic fertilisers with the grain crops. On the contrary, the systematic use of phosphoric acid is in most cases necessary, as the drain on this valuable soil constituent is very great in bone-making where stock are reared and sold off the farm, and no adequate return is made to the land in their manure.

One outstanding advantage of such rotation is that the labour is equalised throughout the year, and this regular employment is far more likely to make for rural stability than the alternate extremes of overwork and scarcity that so often prevail to-day.

AN UNUSUAL HIVE.

MR. A. E. IBBOTSON, Apiary Inspector, in a recent visit to the Southern District, came across a swarm of bees which had settled under an old swing board, and has supplied the accompanying illustration. This board was hanging under an elm tree well protected from the wet, but still hanging in the open, waving backwards and forwards as the wind blew. The comb was about one foot deep, and the bees were working well, apparently quite indifferent to the exposure to the open air. Rather than leave their old locality they sought the best shelter procurable. The illustration will give a good idea of the actual conditions.

List of Fertilisers in New South Wales.

F. B. GUTHRIE, A. A. RAMSAY, AND C. R. BARKER.

1917 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, is the result of the revision of the list issued in April, 1916.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Fertilisers Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

On account of the war, potash manures are unprocurable, and the market value of all other manures is changing from time to time, and to such an extent that the price of such manures as are procurable at the present moment is subject to continual alteration. Under these circumstances it is impossible to assign a unit value to any ingredient as has been done in former years.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid"—in these cases, the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

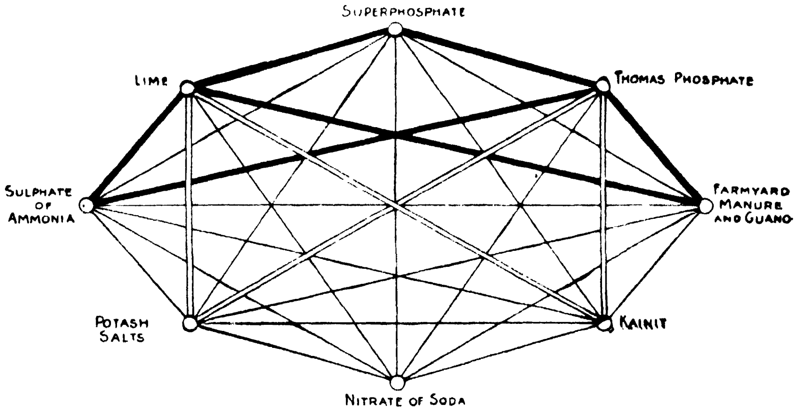
If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed.

In the fourth table are a number of waste products which may in many cases be utilised economically.

When purchasing a manure, always insist on a guarantee of its composition as determined by analysis.

Never add lime to a manure containing sulphate of ammonia or to blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land, do not use manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single line may be mixed together at any time.

TABLE I.—SIMPLE FERTILISERS.

Manure.	Where obtainable.	Guaranteed Composition.				
		Nitrogen.	Equal to Ammonia.	Lime.	Potash.	Phosphoric Acid.
Sulphate of ammonia..	Australian Gas Light Co., Kent-street ..	20·42	24·82	....	..	....
Nitrate of soda ..	George Shirley, Ltd., 7 Bent-street ..	15·5	18·82	....	..	....
Sulphate of ammonia..	,, ,, ..	20·	24·77	....	..	....
"Triphosfate" ..	N.S.W. Phosphates Co., Ltd., 18 Hunter-street.	....	....	....	..	18·68
Gypsum..	Farmers' Fertilisers Corporation, Ltd., 31 Hunter-street.	....	....	96% Cryst. $CaSo_4$	..	....
Nitrate of soda ..	,, ,, ..	15·9	19·31	....	..	....
Sulphate of ammonia..	,, ,, ..	20·4	24·77	....	..	....
Guano	Paton, Burns, & Co., 75 York-street ..	....	....	....	..	27·48
Sulphate of ammonia..	,, ,, ..	20·4	24·77	....	..	...
Nitrate of soda ..	,, ,, ..	15·5	18·82	....	..	....

II.—BONE AND BLOOD MANURES.

Manure.	Where obtainable.	Guaranteed Composition.			
		Nitrogen.	Equal to Ammonia.	Phosphoric Acid.	Equal to Tricalcic Phosphate.
No. 0—Phosphatic manure	Wooster Fertilisers, Ltd., O'Riordan-st., Alexandria ...	3·3	4·0	20·61	45·0
No. 1—General purpose bone-dust ..	,, ,, ,, ,, ...	3·7	4·5	21·98	48·0
No. 2—Pure steamed bone-dust ...	,, ,, ,, ,, ...	3·91	4·75	24·50	53·5
No. 3—Blood and bone manure ...	,, ,, ,, ,, ...	5·76	7·00	13·74	30·0
No. 5—Raw or green bone-dust ...	,, ,, ,, ,, ...	4·01	4·86	24·41	53·3
Bone and blood manure	Kitchen and Sons, Ltd., 365 Kent-street	5·5	6·68	17·0	37·11
Special bone and blood manure ...	,, ,, ,, ...	6·0	7·29	13·0	28·38
Bone-dust	M. O'Riordan and Sons, O'Riordan-street, Alexandria ...	3·7	4·5	21·98	48·0
Blood	B. Richards and Sons, Ltd., Riverstone	13·43	16·28	....	....
Bone-dust	,, ,, ...	3·17	3·85	26·78	58·51
Excelsior bone-dust	M. Gearin, Old Botany-road, Mascot	3·7	4·5	23·47	51·24
Bone phosphate...	Geo. Shirley, Ltd., 7 Bent-street	0·5	0·61	29·8	65·06
Bone-dust	,, ,, ...	3·5	4·25	22·0	48·03
Sandown fertiliser	J. Cooke & Co., Propy., Limited, Sandown Works, Parramatta.	6·85	8·32	10·44	22·82
Pure fertiliser	N.S.W. State Abattoirs, Homebush Bay	6·68	8·11	12·87	28·10
Bone and blood	Farmers' Fertilisers Corp., Ltd., 31 Hunter-street ...	6·5	7·89	10·0	21·83
Bone and blood	,, ,, ,, ...	6·75	8·20	14·0	30·56
Bone and blood	R. S. Lamb & Co., Ltd., 32 Jamieson-street	4·94	6·0	13·74	30·0
Three star bone-dust	,, ,, ,, ...	3·75	4·55	22·91	50·0
Bone-dust, B.D. 1	Paton, Burns, & Co., 75 York-street	3·7	4·5	22·12	48·29
,, B.D. 2	,, ,, ,, ...	3·7	4·5	22·12	48·29
,, B.D. 3	,, ,, ,, ...	3·3	4·0	20·7	45·19
,, B.D. 4	,, ,, ,, ...	3·3	4·0	18·4	40·17
Bone and blood, B.B. 1	,, ,, ,, ...	7·0	8·50	9·0	19·65
,, ,, B.B. 2	,, ,, ,, ...	5·5	6·68	17·0	37·11
Bone phosphate...	,, ,, ,, ...	... .	....	29·77	64·99
Dried b'ood	,, ,, ,, ...	13·0	15·79	....	....

III.—SUPERPHOSPHATES, MIXED FERTILISERS, AND IMPORTED MANURES.

Manure.	Where obtainable.	Guaranteed Composition.			
		Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.
Superphosphate 36/38	George Shirley, Limited, 7 Bent-street	....	17·0	....	....
Superphosphate Basic	,, ,, ,,	....	0·7	19·7	....
No. 8	,, ,, ,,	4·0	13·0	....	....
No. 10	,, ,, ,,	2·0	13·0	....	....
No. 20	,, ,, ,,	4·0	10·0	....	4·0
No. 21	,, ,, ,,	....	....	10·0	4·0
No. 22	,, ,, ,,	....	10·0	....	4·0
No. 23	,, ,, ,,	....	....	20·0	5·0
No. 24	,, ,, ,,	4·0	....	15·0	4·0
Sulphide Superphosphate	Gibbs, Bright, & Co., Ltd., 37 Pitt-street	....	17·0	....	....
Nitro Superphosphate	,, ,,	1·6	15·0	....	....
No. 1 Bone and superphosphate	,, ,,	1·5	8·5	19·0	....
No. 2 ,, ,,	,, ,,	0·8	13·0	19·0	....
Potato manure	,, ,,	1·25	14·5	16·0	3·5
Orchard manure	,, ,,	2·3	13·0	14·5	4·5
Maize and fodder crop	,, ,,	3·0	11·0	14·0	1·0
Root crop	,, ,,	3·25	7·5	10·0	3·0
Leguminous	,, ,,	....	15·5	18·0	2·4
Special orchard manure	,, ,,	2·3	12·0	12·8	7·25
Superphosphate	Paton, Burns, & Co., 75 York-street	....	17·0	....	....
No. 1 Superphosphate	Farmers' Fertilisers Corporation, Ltd., 31 Hunter-street.	....	17·0	....	....
A1 Superphosphate	,, ,, ,, ,,	....	20·0	....	....

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET.

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
Deposit from wool-scouring tanks. 1	Liverpool Wool-scouring Works	....	....	·64	·78	....	....	....	·72
„ 2	„ „ „	....	....	1·02	1·24	....	....	·16	·39
„ 3	„ „ „	....	....	1·37	1·66	....	....	·14	·2
Deposit from breakers	„ „ „	34·47		1·81	2·20	50·68	·85	·88	1·60
Sediment from wool-scouring works.	Yass	19·57		·59	·71	8·24	·97	....	·20
Scutch	Australian Glue-Gelatin Works, Alexandria.	56·98	....	2·95	3·58	....	4·56	None.	None.
„ from limed pelts	Hugh Wright, Auburn	5·32	72·42	1·80	2·18	3·61	9·36	·89	·20
Decomposed hair and lime	Fellmongery	9·70	57.08	6·86	8·83	1·22	26·27	....	....
Tan-yard refuse	Tanneries, St. Mary's	6·43	33·83	2·24	2·72	21·43	26·96	·67	....
Tan refuse	....	7·10	50·90	2·62	3·18	16·03	18·58	·56	·18
Fleshings from tannery	....	·91	75·37	44·43	5·38	5·98	....	1·14	·04
Salt (sweepings from tannery)	....	3·04	....	·70	·85	·38	....	....	....
Wool-waste	....	....	....	8·15	9·89	....	....	....	....
„	....	34·33	28·20	1·97	2·39	26·03	2·75	·37	·32
Peat	H. Tager, Moss Vale	72·93	16·68	·35	·42	10·39 (ash).	....	....	....
„	S. Cook, Pyrmont	49·51	34·63	·75	·91	....	....	·06	·01
Burnt peat	....	....	....	....	....	84·45	....	·25	·33
Filter-press muck	Cane-mills, Broadwater	16·39	26·07	·22	·27	34·86	13·20	5·98	·44
Megass	Clarence River cane	22·86	67·32	·63	·78	8·61	·30	·01	·05
Megass ash	„ „	....	....	....	....	87·69	3·07	·16	·51
„	Richmond River cane	....	....	....	....	....	1·11	·21	4·79
Bloodwood ash	....	....	....	....	....	....	8·47	·27	5·25
Ironbark ash	....	....	....	....	....	....	....	·82	1·53
Blackbutt ash	....	....	....	....	....	....	7·27	·04	2·02
Red-gum ash	....	....	....	....	....	....	....	·38	4·17
Spotted-gum ash	....	....	....	....	....	....	....	·10	·70
Boxwood ash	....	....	....	....	....	....	....	·67	1·65
Grass-tree ash	....	·86	1·78	....	....	33·48	24·94	3·07	5·30
Vine-cuttings ash	....	·49	....	....	....	60·64	11·34	1·85	3·76
Red-apple ash	....	....	....	....	....	54·52	13·96	·47	6·00
She-oak ash	....	....	....	....	....	8·57	42·35	8·85	2·19
Hardwood ash	....	·50	1·35	....	....	62·38	13·50	1·76	3·09
Ash of wild melon	Stock Branch	....	....	....	....	....	5·12	4·85	27·08
Wood ashes	....	·30	....	....	....	21·43	41·37	·35	2·80
„	Wentworth Irrigation Area	....	....	....	....	11·12	50·78	·58	3·21
Ash of kerosene shale	Hartley Vale	1·49	27·93	·70	·85	67 59	....	·28	·14
Eucalyptus leaves ash	....	....	....	....	....	....	....	....	10·54
„ „	....	....	....	....	....	....	....	....	20·50
Camphor laurel ash	....	....	....	....	....	....	....	....	2·55
Coachwood and sassafras wood ash.	....	....	....	....	....	....	16·16	3 60	13·53

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
Coals (ash)	...	...	...	...	...	...	·64	·29	·16
Clinker from locomotive boiler	...	...	...	...	...	...	...	...	·25
Residue from furnace	R. E. Bragg, Marrickville	1·55	35·63	·54	·61	52·40	·64	·43	·09
Sea-weed ash	...	...	...	...	...	...	9·27	·49	·59
,,	...	...	...	...	...	...	6·29	1·27	17·55
,,	...	·43	...	...	...	56·28	9·39	·47	2·26
,,	Manly	...	...	...	...	43·06	6·52	·91	13·98
,,	,,	...	...	...	...	·07	·53	·19	34·30
,,	Mr. Harvey, Department	3·25	19·46	...	...	61·63	4·22	·33	·22
,,	...	...	...	...	...	...	4·63	1·00	31·41
Sea-weed, fresh state	...	80·00	...	·16	·19	...	·41	·09	1·18
Sea-weed	...	41·03	42·49	·14	·17	...	...	·21	·60
Sea-weed, dried	...	18·58	65·97	1·64	1·99	15·44 (ash).	3·44	·14	·14
Air-slacked lime	...	16·58	...	...	...	1·88	75·44	...	...
Residue from calcium carbide	...	41·36	...	...	...	1·08	36·19	...	...
Limestone rock	Queanbeyan	1·10	...	...	...	4·70	48·20	1·22	...
Agricultural lime	Portland Cement Co.	18·43	...	...	...	23·80	Hydrate 13·80 Carbonate 43·97	...	...
Gypsum	Marulan		(Crystallised $CaSO_4$ = 92·64)			4·47	...	...	...
Cave deposit, shells, &c.	Cowan, Hawkesbury River	2·11	...	·82	1·00	...	35·40	1·59	·88
,, ,,	Macleay River	23·06	16·01	2·43	2·95	26·77	13·88	7·40	...
Deposit (coral, shell, &c.)	Pacific Islands	2·13	13·53	·72	·87	...	44·00	3·53	·39
Shells	Pambula River	...	...	...	...	...	44·59	·10	...
Flue deposit	Maitland	...	...	...	...	83·75	2·56	·32	·31
,,	Liverpool	...	...	...	...	91·17	·42	1·29	·17
,, from sanitary furnace	...	...	...	...	...	63·53	6·04	1·82	1·61
,,	...	6·30	2·45	...	...	84·89	·32	·35	·38
Night-soil mixed with lime	...	44·33		·74	·89	18·60	7·62	·78	...
Night-soil	Wagga Wagga	6·70		·03	·04	82·19	·44	·28	·69
,,	,,	9·14		·28	·34	78·92	1·18	·18	·54
,,	,,	...		·50	·61	...	...	·64	·62
Night-soil preparation, No. 1	...	8·22		3·73	4·63	50·22	13·32	9·65	·91
,, ,, No. 2	...	7·20		1·83	2·22	29·02	8·05	4·10	·15
,, ,, No. 3	...	25·95		1·64	1·99	60·17	1·39	1·61	·70
,, **preparation, "Pinhoe" manure.**	...	·92	9·54	·21	·25	57·58	14·71	1·26	·56
Night-soil preparation	F. Artlett, Parramatta	7·33	30·06	2·10	2·55	46·38	2·09	1·92	·61
,, ,,	,, ,,	10·11	42·59	4·97	6·03	·94	30·12	·39	...
,, ,,	Mr. Halstead, O'Brien's patent	1·54	12·36	·54	·65	77·95	...	·63	...
,, ,,	...	29·52	56·15	2·55	3·10	14·33 (ash).	...	...	...

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

Manure.	Original Source.	Water.	Volatile. and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.
Street sweepings	Sydney Municipal Council	61·63	19·57	·35	·43	15·45	....	·42	·28
Farmyard manure	....	67·96	22·09	·40	·49	8·16	·16	·20	·30
Stable manure	Bathurst	39·26	....	·41	·50	....	....	·27	·67
Fowl manure	....	3·95	16·48	1·47	1·78	70·16	2·10	1·94	....
"	....	1·54	15·23	·86	1·04	79·96	·64	·59	·33
Sheep manure	Bathurst	7·73	....	1·06	1·30	....	....	·69	1·17
"	Liverpool Wool-scouring Works	9·71	50·91	1·79	2·17	32·26	2·30	·91	·92
Sheep dag	....	....	....	3·04	3·69	....	....	....	....
Refuse manure	Abattoirs	12·00	74·51	4·14	5·03	6·56	....	1·80	....
Flying-fox manure	....	1·09	35·34	3·34	4·05	50·29	1·02	·36	1·15
Fish fertiliser	....	14·47	64·36	10·37	12·59	4·52	....	....	....
Shark fertiliser	....	9·02	68·04	10·59	12·85	3·86	....	7·27	....
Fish manure	....	10·88	59·26	6·10	7·40	5·39	9·82	8·28	....
Rabbit hair, long	Anderson, Oxford-street	8·73	88·64	14·03	17·04	3·63 (ash).	....	....	....
" short	" "	9·72	87·76	14·00	17·00	2·82 (ash).	....	....	....
Bat guano	....	14·11	17·69	1·55	1·88	28·77	13·72	11·42	....
"	....	10·86	19·65	2·24	2·72	51·95	1·75	3·55	·15
"	....	13·70	34·35	4·76	5·78	3·30	22·28	13·04	trace.
Bat deposit	Cave Flat, Cooradigbee	5·43	12·98	·50	·61	57·64	5·60	12·12	....
Guano deposit	Tamworth	8·75	38·40	6·17	7·49	12·85	....	9·24	....
" "	"	8·42	20·97	3·10	3·76	31·89	....	7·87	....
" "	"	14·55	29·91	3·66	4·44	15·81	....	12·98	....
" "	"	9·35	44·32	6·73	8·17	7·33	....	13·17	....
Deposit from cave	L. R. Mercy, Ashford	23·75	35·57	3·63	4·29	1·65	16·32	11·28	·60
Bone breccia	Queanbeyan	5·71	....	·59	·72	9·48	42·80	3·11	....
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	·90	63·42	4·56	·31	·60
Muck raked from waterhole	....	63·66	29·86	·81	·98	3·80	·96	·10	·06
Sawdust	....	33·52	62·35	·82	1·00	....	....	1·70	·05
Decayed wood, bark and leaves, bloodwood.	....	57·80		·74	·89	40·68	1·30	....	....
Decayed wood, bark and leaves, pepper-tree.	....	79·92		·89	1·08	17·77	1·50	....	....
Coco-nut oil cake	....	8·24	....	3·29	3·99	....	....	1·20	1·49
Castor cake	....	18·81	74·08	4.30	5·22	....	....	1·83	·86
Pea cake	Java	16·02	....	7·24	8·79	....	....	1·46	1·17
Bean cake	North China	14·52	80·32	6·77	8·22	....	....	1·33	1·99
Rice husks	....	42·74	42·15	1·07	1·30	13·77	·02	·03	·04
Field pea, whole plant	....	88·58	9·97	·55	·67	....	·15	·12	·49
Tares, whole plant	....	83·97	14·96	·73	·88	......	....	·11	·21
Marsh mallow, whole plant	....	79·00	17·86	·85	1·03	....	....	·14	·69
Horse bean, leaves and stalks	....	82·87	15·90	·90	1·09	....	·05	·11	·54

Farmers' Experiment Plots.

SOUTH COAST WINTER FODDER EXPERIMENTS, 1916.

R. N. MAKIN, Inspector of Agriculture.

THE farmers' winter fodder experiments conducted on the South Coast during the winter of 1916 met very dry and frosty weather conditions, and in several cases the crops failed owing to these troubles. In addition, rabbits were very troublesome in some districts where the paddocks were not netted; at Unanderra a plot of about 5 acres was completely ruined by the pest.

Sowing commenced about the middle of March and was finished early in May, the ground in most cases having been prepared early and cross-ploughed just prior to sowing. The seed was sown at the rate of 2 bushels per acre broadcasted, and 1½ bushels drilled. Superphosphate was applied in the variety tests at the rate of 1 cwt. per acre, previous tests with manures having justified the use of this manure. The plots at Unanderra, Dapto, Albion Park, Gerringong, and Mittagong, were sown with the wheat drill; elsewhere they were broadcasted. South Coast farmers have not yet fully recognised the value of the wheat drill, but in several districts machines have been purchased by progressive men and have been used profitably. When this method of sowing is better known, the use of drills will be more general. There was a good germination throughout, and when the crops were well up they were harrowed.

The dry weather was responsible for the failure of the plot at Moruya, where only 521 points of rain fell between 1st April and 31st August. In fact, all the early sown crops suffered from the same trouble. A late sown crop at Kangaroo Valley met with favourable weather conditions in September, and good returns were secured in October, when the crops ran into ear.

The object of the experiments, however, was to produce crops fit for green feed from the end of July onwards, until the spring grass and fodders were available. This season the crops were backward, due, no doubt, to the cold dry weather. The first were ready about the middle of August at Albion Park.

The question as to the best time for sowing for green fodder often arises, and many farmers have been known to sow wheat in February, hoping to obtain early fodder. This is too early, as the heat and the dry weather usually met with in April, brings the young plants into ear when only a few inches high. So far as the sowing of farmers' plots has been conducted, the best results have been obtained when the seed is sown between about the middle of March and about the same time in April.

In sowing wheat or oats for green fodder, it is a good practice to sow field peas or vetches with them at about the rate of 20 lb. peas, or 10 lb. vetches, per acre. The combined fodder is much more palatable to the stock than the cereal alone.

On glancing at the tabulated returns of the past season's experiments, it will be found that, in comparison with other years, the yields are lower. The reasons for this have already been stated. The most striking feature of the variety tests was the success of Thew wheat under the dry weather conditions. Undoubtedly this is the most reliable of early fodder varieties so far tested on the South Coast. A wheat named Bunge, raised in Queensland, was under test, but did not do well, taking rust badly. It is not recommended for further trial. The tests with Huguenot again proved that it is not suitable for early fodder owing to its late maturity; it is hardy and frequently yields very well. Firbank and Florence were disappointing this season. In most cases they were badly affected with rust.

SOUTH COAST WINTER FODDER PLOTS, 1916.

Wheat Variety Trials.

Variety.	J. Timbs, Albion Park.	T. A. Bateman, Albion Park.	C. Ingold, Milton.	J. H. Martin Pambula.	H. Chittick, Gerringong.	Farm Homes, Mittagong.	J. Chittick, Kangaroo Valley.
	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.
Florence ..	2 10 2 24	3 2 3 12	8 14 1 4	3 12 2 24	3 2 3 8	6 1 1 20	6 15 0 0
Firbank ..	4 1 1 20	3 0 0 0	4 14 1 4	3 12 3 12	3 11 1 20	7 0 0 0	8 8 3 0
Thew	6 17 3 12	6 7 3 12	6 0 0 0	5 14 1 4	4 6 1 20	6 15 0 20	11 2 0 16
Huguenot ..	7 5 0 0	5 5 0 16	....	11 13 2 8	....	....	....
Bunge	....	2 17 0 16	....	....	....	....	....
King's Early ..	....	....	....	....	....	6 11 1 20	....

SOUTH COAST WINTER FODDER PLOTS, 1916.

Mixed Fodder Trials.

	*Wheat and Field Peas.	*Wheat and Vetches.
	t. c. qr. lb.	t. c. qr. lb.
J. Timbs, Albion Park	8 6 1 20	8 9 1 14
T. A. Bateman, Albion Park	2 7 0 12	....
J. H. Martin, Pambula...	11 14 1 14	10 16 1 20
Farm Homes, Mittagong	9 5 0 24	10 10 0 0

* Huguenot wheat was used throughout in these trials.

The test of different varieties of oats was of much interest, as several new varieties were tried. Ruakura, which has been favourably reported upon in previous experiments, upheld its reputation and no doubt will be largely grown when the supply of seed becomes more plentiful. Sunrise, an oat produced by the Department, made quicker growth than any other variety. It needs to be sown thickly as it stools poorly. The straw is weak, and heavy crops are likely to lodge badly. Still, as a fodder variety it will probably prove useful on account of its earliness. Guyra and Cowra, two more varieties produced on the farms of this Department, were found to be extremely rust-liable, and are therefore not to be recommended. Algerian, in most cases, rusted badly and came in late; this oat seems to be losing its rust-resistance, for complaints were heard in many directions during the season on this score. On many of the experiment plots it took rust whilst Ruakura and Sunrise growing alongside were comparatively free.

SOUTH COAST WINTER FODDER PLOTS, 1916.

Oats Variety Trials.

	Algerian.	Ruakura.	Sunrise.	Guyra.	Cowra.
	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.
J. Timbs, Albion Park	5 0 0 0	5 5 2 9	4 17 0 16	....	......
T. A. Bateman, Albion Park	4 2 3 12	4 4 1 4	8 6 1 20	....	......
C. Ingold, Milton	7 0 0 0	10 16 3 24	8 1 1 20	....	......
J. H. Martin, Pambula	6 18 2 8	5 1 1 20	5 17 0 16	5 8 2 8	6 17 3 12
H. Chittick, Gerringong	11 7 0 16	13 3 2 8	11 15 2 24	....	......
Farm Homes, Mittagong	7 8 2 8	7 11 1 20	8 2 3 12	....	......
J. Chittick, Kangaroo Valley	9 1 1 20	11 2 0 16	10 17 3 12	....	......
G. Lindsay, Dapto	4 12 3 12	7 2 3 12	4 7 3 12	4 15 0 0	......

Under the dry weather conditions, little could be expected from the use of artificial manures; still there is a difference to be noted in the returns. The use of 1 cwt. of superphosphate per acre is apparently justified when the results are compared with those from untreated plots. A feature that cannot be shown in the tabulated returns, is the fact that manured plots are generally earlier in maturing than those not treated. Without sufficient rain, the full benefits of artificial manures are not obtained, but it must be admitted that it pays to use small quantities in growing winter fodders.

SOUTH COAST WINTER FODDER PLOTS, 1916.

Wheat Manurial Trials.

Manure.	J. Timbs, Albion Park.	T. A. Bateman, Albion Park.	C. Ingold, Milton.	J. H. Martin Pambula.	H. Chittick, Gerringong.	Farm Homes, Mittagong.	J. Chittick, Kangaroo Valley.
	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.
Superphosphate, 1 cwt. per acre.	6 17 3 12	3 0 0 0	8 14 1 4	5 14 1 4	3 8 2 8	6 1 1 20	6 15 0 0
Superphosphate, 2 cwt. per acre.	6 8 2 8	3 2 0 16	6 11 1 20	4 13 2 8	3 2 3 12	7 12 3 12	7 1 1 20
Bonedust and Superphosphate, 2 cwt. per acre.	6 12 3 12	2 17 0 16	5 8 2 8	4 0 0 0	3 10 2 24	6 4 1 4	7 9 1 4
No manure ..	4 18 1 16	2 14 1 4	5 14 1 4	4 2 3 12	3 0 2 24	5 7 0 16	5 17 2 20
*'Thomas' Phosphate.	7 12 2 14	2 11 1 20	7 0 0 0	4 7 3 12	....	6 18 2 8	8 15 0 0
†P5 1¼ cwt. per acre.	7 17 2 20	6 14 1 4	7 5 2 24	4 15 0 0	3 6 0 0	6 15 0 20	5 7 3 12

* The qualities varied; 160 lb. were applied in both cases at Albion Park, and 2 cwt. at Pambula, Gerringong, Mittagong, and Kangaroo Valley; at Mr. Bateman's, Albion Park, Wellington rock phosphate was used. † Consists of 16 parts superphosphate and 4 parts sulphate of potash.

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director of the Botanic Gardens, Sydney.

St. Barnaby's Thistle (*Centaurea solstitialis* L.).

(COMPOSITÆ : Thistle or Daisy Family.)

Popular description.—An annual plant, with a yellow, prickly thistle-like flower; the whole plant covered with a short whitish cottony covering; the lower or radical leaves dissected, the terminal lobe larger than the lower ones, and the upper ones linear, with wavy edges.

Botanical description.—"Stem near 2 feet high, alternately branched, winged from the decurrent leaves, which are lanceolate and entire, slightly waved; the radical leaves are 4 or 5 inches long, lyrate, the lobes alternate, acute, the terminal one large, and more or less triangular. Flowers solitary at the end of each branch, bright yellow. Scales of the calyx tipped with palmated yellowish spines, of which the central one is very long, strong, and different from the rest. The whole herb is harsh and rigid, but clothed with a cotton-like web (as is the calyx), somewhat viscid, and intensely bitter."—(Sowerby's *English Botany*, xii, t. 243.)

Allied Thistles.—We have already figured and described two *Centaureas*, viz., *C. calcitrapa*, the ordinary Star Thistle (see *Gazette* for 1894, p. 468), and *C. melitensis*, the Cockspur (see *Gazette* for 1895, p. 149). The former is pink-flowered, and the latter is yellow-flowered like the weed now under description.

Comparing the two yellow thistles, Bentham says that "*C. solstitialis* is an annual, with the habit, foliage and yellow florets of *C. melitensis*, but with a much longer and stouter spine to the intermediate involucral bracts, while the inner ones have a jagged scarious appendage without any spine."

Names.—Sowerby wrote in his "English Botany" considerably over a century ago, "It flowers about midsummer, whence the name, but lasts till late in autumn, and in the south of Europe even till December." The name referred to is St. Barnaby's Thistle (apostle and saint), and his day is 11th June, which explains the reference to midsummer.

"Yellow Thistle" or "Yellow Star Thistle" which it shares with *C. melitensis.*

Where found.—It is a native of Europe, North America, and Western Asia. It has become extensively distributed in Australia, having been recorded from practically from every State. In New South Wales it is widely diffused. Western localities are Richmond and Bathurst; southern ones, Burrinjuck and Queanbeyan; but it doubtless occurs far beyond these boundaries. A correspondent from Tamworth in January last wrote: "I saw only a very few plants of it until to-day, when I saw a paddock very badly infested."

As a rule it is looked upon as a weed pure and simple, and the advice is given to eradicate it when it is in flower, as it is an annual and must not be allowed to seed. The following paragraph will give food for thought.

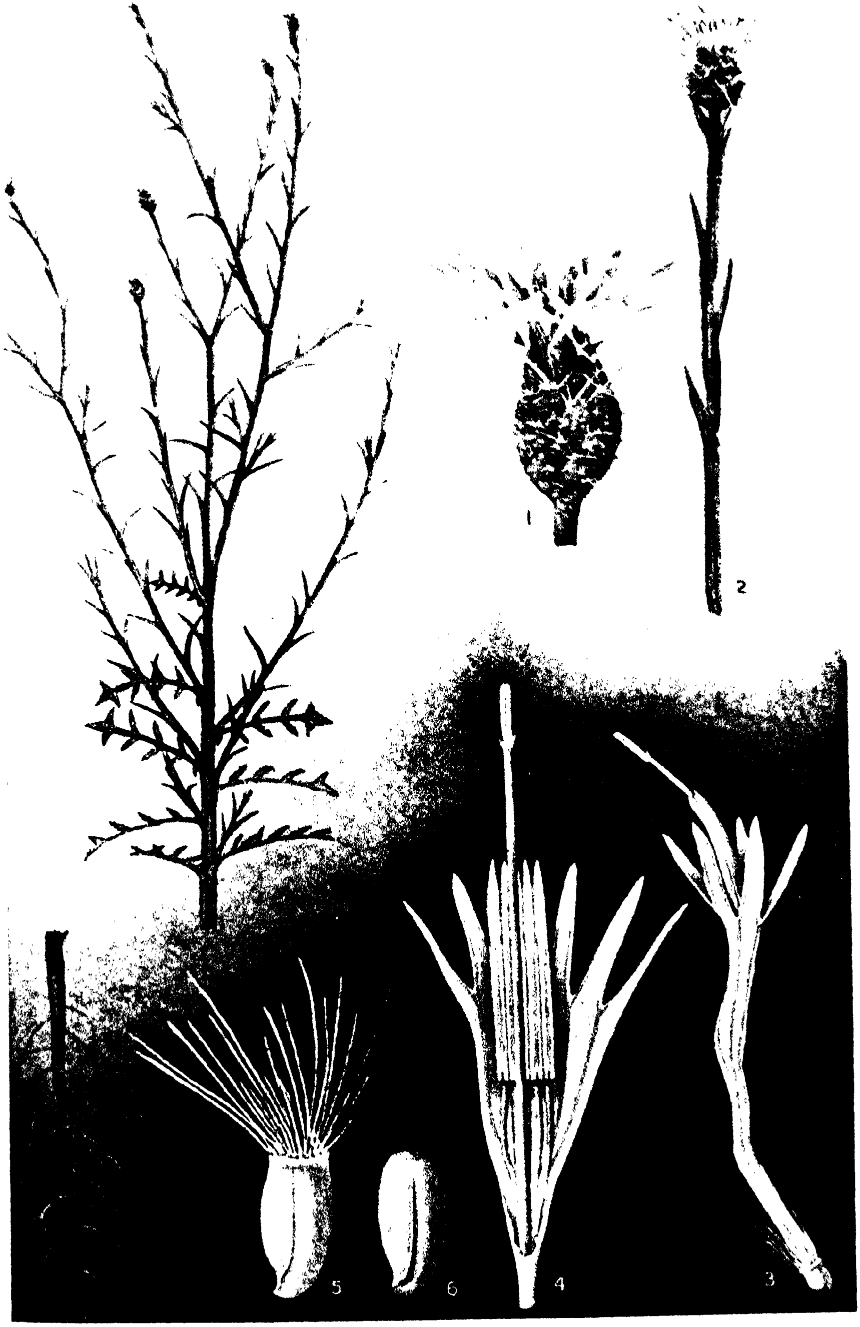
A plea for further investigation.—A Western Australian farmer having raised the question of the value of this weed as sheep-food, and the danger of sheep eating the seeds infecting clean land, Mr. W. C. Grasby dealt with the matter in an informative manner in a recent issue of the *Western Mail.* Mr. Grasby had had a good deal of experience with this weed in South Australia, where it seems to be commoner than in any other State. He says :—

> If a farmer desires to carry on the business of wheat-growing pure and simple, it is desirable to do everything possible to prevent the spreading of Cockspur (St. Barnaby's Thistle is meant), Cape Weed, and other plants which grow on the fallow. If, however, it is desired to conduct the business of wheat-growing in conjunction with sheep, it is desirable to have every kind of plant which will produce good sheep feed, growing on the land. A Tammin farmer in reply to an agricultural expert who pointed out the presence of Cockspur, Cape Weed, Wild Mustard, &c., said, "I want to keep sheep, and the more weeds my land will grow the more sheep I can keep, and if I have sheep I can control the weeds when I want to grow wheat."
>
> In boyhood I have spent many weary days in hoeing up such weeds, but now I look upon Cockspur and other weeds from a different point of view and, before I condemn, I ask their value as sheep feed. As I go through the wheat belt I find that farmers who keep sheep would rather have Cockspur than be without it. There is a prevailing opinion that wheat-growing by itself is not profitable with present averages and prices, and, in order to keep sheep, farmers must have what are called weeds, which will support the sheep when the land is not in crop. From another point of view, it is necessary to have weeds and sheep. We cannot carry out the systems of rotation developed in countries where summer rains are the rule and not the exception ; and under clean fallow and alternate cropping, land must rapidly deteriorate in fertility. It is not in accordance with book teaching, but it appears to me that we have to look upon edible weeds, such as have been mentioned, and more especially the wild clovers, as a rotation of crops which cost nothing and are best suited to our climatic conditions. Of course, it is not suggested clovers and trefoil are as valuable as Cockspur.
>
> As to the distribution of seeds by sheep, there is room for difference of opinion. A farmer of wide experience says that sheep do not, to an appreciable extent, distribute the seeds of plants that they eat, but those which are carried in the wool, and he gives a good deal of evidence in support of his opinion. He points out that weeds of various kinds grow where horse droppings and cattle droppings are found, but not to the same extent when sheep have travelled. He states that he has carefully examined and washed the droppings of sheep and, so far, has failed to discover clover seeds which have not been digested.
>
> Looking at the question from every point of view, I think I may without hesitation advise that, if a farmer wishes to keep his fallow clean, the wise plan will be to keep the sheep off. Probably the best plan will be to put the mower over weedy ground, rake up the Cockspur and burn it, and then keep the ground free of crop and surface cultivated, whenever the Cockspur appears, until it is all destroyed. The ground, in the meantime, should not be ploughed, for that will bury the seeds. It is entirely for any individual to decide whether the value of the Cockspur on the fallow for the keeping of sheep will pay for having this weed present on the land. I think it will, but I would be glad if those old farmers who have had considerable personal experience, would be good enough to contribute their experience.

EXPLANATION OF PLATE.

Portion of plant, much reduced in size.

1. Flower enlarged.
2. Flowering branch, natural size.
3. A floret.
4. Floret opened to show stigma and anthers.
5. Achene showing arrangement of pappus.
6. Mature achene (seed).



WEEDS OF NEW SOUTH WALES.

'ST. BARNABY'S THISTLE.'

Centaurea solstitialis L.

Soliva sessilis (Ruiz and Pavon).

(COMPOSITÆ Family, but it would not be proper to call it Daisy Family.)

Popular description.—A small, insignificant plant with finely divided small leaves and inconspicuous greenish flowers, and bearing a profusion of burrs armed with numerous spines.

Botanical description.—Villous, or the leaves glabrous, twice divided, primary divisions 3–5, petiolate, parted into 3–5 narrow lanceolate lobes; flower heads depressed; achenes broadly obovate, thin-winged, the wings entire or sometimes panduriform-excised near the base, spinulose-pointed at summit, in some wings reduced to an acute margin; persistent style long and stout. (Gray's "Synoptical Flora of North America," p. 365.)

A close relation.—"*Gymnostyles anthemifolia* is stated by M. de Jussieu to be a native of New South Wales, but as I have observed it only in cultivated ground in the neighbourhood of Sydney, and as it has certainly been found in South America, of which four other species of the genus are undoubtedly natives, it has probably been imported into New South Wales, perhaps from Brazil." (Robert Brown, in the "Proceedings of the Linnean Society of London," vol. xii, p. 102, published in the year 1818.)

This is *Soliva anthemifolia*, which, although described in the *Flora Australiensis* iii, 552, is clearly indicated as an introduction, in these words:—

"A small genus, apparently limited to the warmer regions of America, except where introduced with cultivation."

Nevertheless, Mueller placed it in his "Census of Australian Plants." It is a larger plant, and less prickly than *S. sessilis*, and is found more or less over the State, extending to the North Coast and the Western Plains.

First record in New South Wales.—The Australian history of the present species (*S. sessilis*) so far as I know it, is as follows:—

It was first sent to the Botanic Gardens in October, 1899, from the Cricket Ground in Moore Park, Sydney, by the late Mr. Sheridan, managing trustee. It is quite easy to imagine how it came to Sydney. A sailor from, say, Chili, where it is very common, would get the burrs in his shore trousers and fold them up when he returned to his ship. Arrived at Sydney he would sit down and witness a cricket match, leaving one or more of the seed-containing burrs on the cricket ground. A small and insignificant plant, it was not noticed until it got a good hold, and I remember how it grieved Mr. Sheridan, for he had received many complaints from patrons who said that they could no longer sit on the grass with comfort; they had to stand up.

The following year it was reported from Parramatta. In 1903, Mr. Jesse Gregson sent it from Newcastle. Since then it has spread abundantly in the coast districts, particularly in sandy grass land.

A Mr. Burgess wrote from East Maitland: "It grows very plentifully in the local Show Ground. The fruits are very sharp and hard, and it is almost impossible to sit on the grass. The fruits also enter the bicycle tyres, and in the course of a day or two work their way through and cause a puncture. The local name is 'Jo Jo.'"

The Mayor of Lambton wrote: "Lambton Park is at present overrun with it. It has completely grown all over the 20 acres, and is a menace to cattle."

It seems to have a preference for well-kept grounds for cricket and other games.

It is impossible to say when it first came to Australia. New South Wales has had direct traffic with South America for very many years, and it is very likely that it came in the tails of horses to Sydney or Eden, or some other part of the South Coast more than half a century ago. It is inconspicuous and therefore could easily be passed over—unless you sat on it.

While a native of Chili, it has spread extensively in other parts of South America, and also to California. It is now widely distributed in sub-tropical countries.

How to get rid of it.—When it is present in quantity it is too costly to attempt to deal with it, except in the case of valuable lawns. In such cases I would get rid of it partly by means of a small, sharp steel trowel, and partly by encouraging the growth of the couch grass by top-dressing, and also by the use of such a stimulant as sulphate of ammonia, which will cause a heavy and smothering growth of grass. There seems no trouble with buffalo grass, the weed, as a rule, losing itself under the coarse mat of this grass.

EXPLANATION OF PLATE.

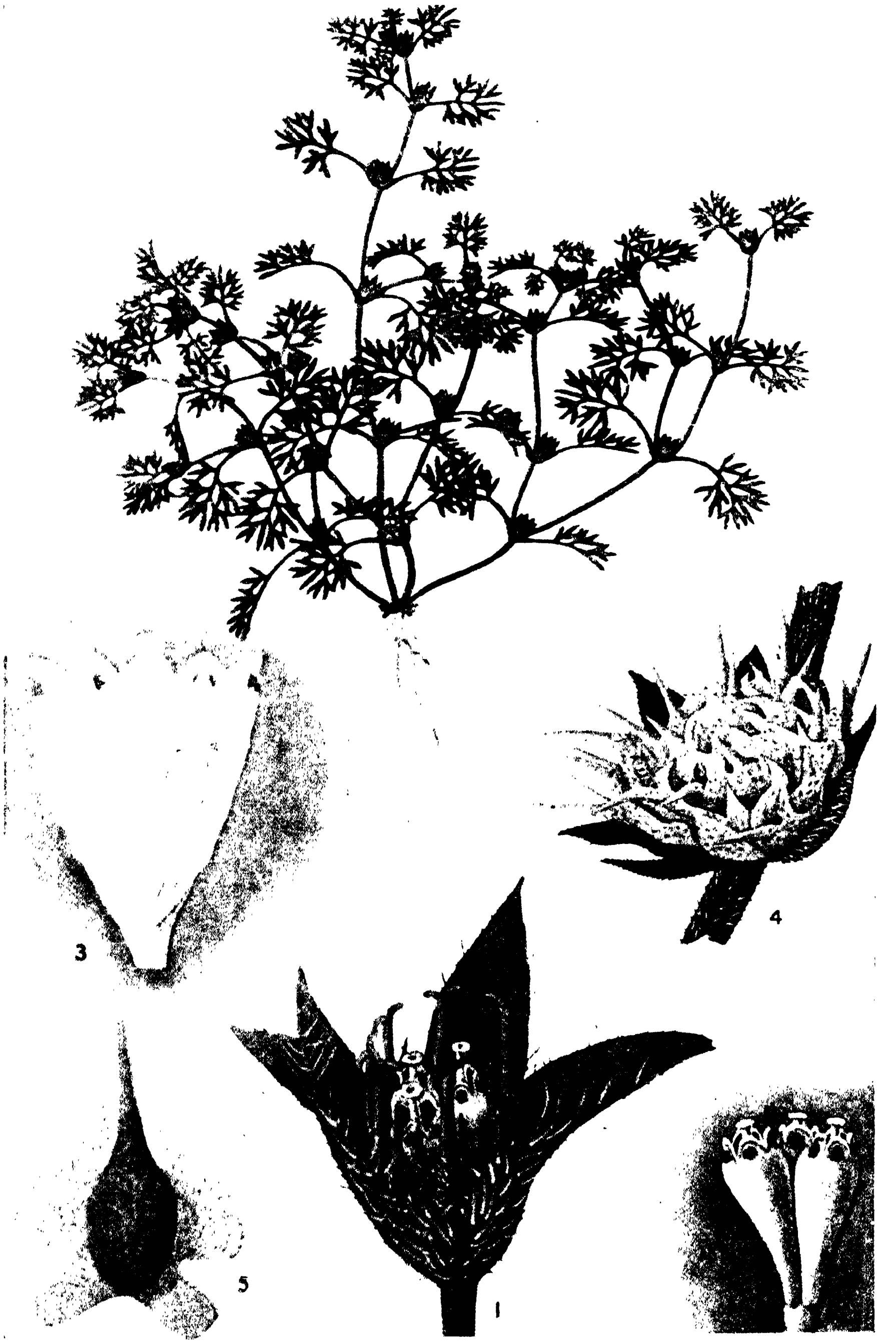
1. Flower-head.
2. Inner, male florets.
3. Male floret open to show anthers.
4. Capitulum in fruit, sessile in a fork.
5. Achene (seed).

A GOOD DAIRY WASH.

THE following is a wash used by many dairy-farmers and one that is recommended by Mr. H. W. Potts, F.C.S., F.L.S., Principal of the Hawkesbury Agricultural College, who supplies the following information as to its preparation and advantages:—

Mix air-slaked lime with freshly skimmed milk to a suitable consistency so that it can be applied smoothly with the brush. To each gallon of this cream-like mixture, add one ounce of ordinary table-salt. It is advisable to make just sufficient wash for the day and to use it fresh. This wash dries readily on wooden or iron surfaces. It possesses the advantage of adhering firmly, does not flake off, and lasts longer than that prepared by most of the other formulæ in use.

It has the additional advantage that the materials are always at hand on dairy-farms.



Weeds of New South Wales.
Soliva sessilis Ruiz. and Pav.
(No vernacular name.)

The Prevention of Bunt.

EXPERIMENTS WITH VARIOUS FUNGICIDES.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S, Biologist.

FOR some years past the Department has been carrying out a number of experiments with various chemicals of known composition and with different proprietary articles for the prevention of bunt in wheat. Generally, the plan adopted has been to infect a number of grains of different varieties of wheat with bunt. Definite numbers of these grains are then subjected to the various treatments under trial, are sown in rows, and the results are compared with check rows of untreated seeds. It is necessary to have two check plots—one containing seed uninfected and untreated with which to compare the effect of the fungicide upon germination, and another containing seed that is infected and untreated with which to compare the fungicide as a bunt preventive. These two factors—the effect of the fungicide upon germination and its effect upon the fungus spores—must never be lost sight of, for while it is comparatively easy to find a fungicide that will prevent bunt spores from growing, it is comparatively difficult to find one that will do this and that will not at the same time seriously impair the germinating capacity of the wheat or inhibit it altogether. The results of a single experiment of this nature may be given as a type of those carried out. Two hundred grains of each of the varieties of wheat, viz., Federation, Comeback, and Bobs, were subjected to the various treatments, all the grain, except that used on the non-infected check plot, being thoroughly infected with bunt before treatment.

Plot.	Variety.	Treatment.	Number germinated.	Per cent. germinated.	Number Bunty.	Per cent. Bunty.
1	Federation	None	140	70	88	62·8
	Comeback		130	65	15	11 6
	Bobs		126	63	109	86·5
2	Federation	1 per cent. copper sulphate solution 10 mins., lime-water 10 mins.	148	74	1	0·67
	Comeback		144	72	1	0·69
	Bobs		148	74	12	8·1
3	Federation	1½ per cent. copper sulphate solution 10 mins, lime-water 10 mins.	156	78	0	0
	Comeback		138	68	0	0
	Bobs		126	63	1	0·79
4	Federation	Shaken with dry copper carbonate.	156	58	3	1·9
	Comeback		128	57	0	0
	Bobs		132	66	1	0·75
5	Federation	"Funguine," as directed	150	75	6	4·0
	Comeback		148	74	7	4·7
	Bobs		126	63	21	16·7
6	Federation	"Corvusine," as directed	138	69	20	14·5
	Comeback		111	69	14	12 6
	Bobs		106	53	70	66 0
*7	Federation	None	150	75	0	0
	Comeback		148	74	0	0
	Bobs		130	65	0	0

* In this case the grain had not been infected with bunt.

There is a further factor which is not dealt with in this particular experiment; that is, the length of time to which the infected wheat is exposed to the action of the fungicide. As in all agricultural experiments, conclusions could only be drawn after repeating the trials a large number of times through a series of years. The main conclusion finally arrived at was this:—

> That when the question of non-injury to the germinating capacity of the grain and fungicidal activity were *both* taken into account, the best treatment for the prevention of bunt in wheat is to dip the grain for three minutes, first into a 1½ per cent. solution of copper sulphate, and then into lime-water for three minutes.

The principal reasons underlying this conclusion were these:—

> Copper sulphate used alone, though an excellent fungicide, has a very detrimental effect upon the subsequent germination of the wheat. Even if used in dilute solution, say, ¼ per cent., it is obvious that as the wheat dries this ¼ per cent. solution, with a film of which each grain is coated, is continually getting stronger.
>
> Lime-water and copper sulphate interact to produce an insoluble substance that does not greatly interfere with the subsequent germination of the wheat.
>
> A solution of copper sulphate of *less* strength than 1½ per cent. does not kill all the bunt spores; a solution of *greater* strength than 1½ per cent. has a deleterious effect upon subsequent germination, even if lime-water be used.

The above, then, may be regarded as the standard treatment for bunt prevention.

It has several serious defects, however.—

(*a*) Dipping wheat and subsequently drying it is rather a messy process.

(*b*) It is held by many that the mere fact of wetting wheat starts germination, and that to dry it subsequently checks that germination; having once been subjected to this treatment, therefore, the grain never recovers the power of forceful germination that it would have had if it had not been wetted.

(*c*) Good lime is difficult to get, and often cannot be obtained at all.

(*d*) Treatment with bluestone and lime prevents the grain running easily through the drill.

Further experiments have therefore been conducted to discover a dry method of treating the wheat. Preliminary experiments with wheat in single drills were made. Among the substances tried, copper carbonate gave such good results that it was decided in 1915 to test it in plots of one-tenth of an acre against the standard method of bluestone and lime. In 1916 it was decided also to test the use of gaseous formaldehyde, commercial formalin being a solution of this gas in water. In plots of one-tenth of an acre it is impossible to be certain that every bunty head of wheat is recognised, but very careful search was made, and the results obtained are regarded as being comparable. The check plots of infected grain, and any of the treated plots that showed infection, had to be carefully watched and harvested, and burnt before there was danger of the disease spreading. While the straw of the grain treated with dry copper carbonate appeared just as good as that treated with bluestone and lime, it has, unfortunately, not been possible to obtain the actual yield of grain from the treated plots, some accident having occurred each time. In 1916, for example, wind, rain, and hail at Cowra settled any prospect of harvesting anything there with accuracy for comparative purposes; in fact, after waiting till January, the wheat in the plots was practically flattened out level with the ground.

The experiments were carried out at Cowra and Wagga Experiment Farms. The details of the experiments in 1916 are given below, those in 1915 being very similar. The 1916 results are especially interesting, as showing how weather conditions may affect fungus attack.

Bunt Experiments at Cowra, 1916.

Five blocks, each one-tenth of an acre, were sown with bunt-infected Firbank wheat. The plots were sown on 26th May, 1916, and examined for bunt on 22nd November.

The details of the various treatments to which the seed was subjected are given later, but for convenience the methods may be briefly mentioned as follows:—

1. Check plot, grain infected and untreated.
2. Grain treated with bluestone and lime-water.
3. Grain treated with dry copper carbonate, at the rate of 2 oz. to the bushel.
4. Grain treated with solution of formalin.
5. Grain treated with formalin vapour.

The results were as follow:—

1. Fully 35 per cent. of the ears were filled with bunt balls.
2. Of ears affected with bunt 124 were found.
3. Eight ears affected with bunt were found.
4. Eight ears affected with bunt were found.
5. Over 35 per cent. of the ears were filled with bunt balls.

The greatest protection from bunt infection, therefore, was given by treatment with dry copper carbonate or with formalin solution; the latter, however, has been shown previously to have a detrimental action upon germination.

Comments.

This experiment is a valuable one—(*a*) because the plots were sufficiently big to test the fungicide on a large scale, and (*b*) because in the check plot of infected but untreated grains fully 35 per cent. of wheat ears produced were bunt-infected.

The effect of dry copper carbonate is especially remarkable, as only eight infected heads were found in the block, against 124 in the crop treated by the standard method (bluestone and lime) and 35 per cent. of the *whole* crop in the untreated plot.

The effect of formalin vapour was disappointing and surprising. While the formalin solution gave much greater immunity from bunt than the standard method (bluestone and lime), formalin vapour gave no such immunity ; on the contrary, the crop was even more heavily infected than the check plot of untreated grain, over 35 per cent. of the whole crop showing bunty heads. Rust was present on the flag, stem, and ears of many of the plants, but not in very great amount. Its presence was due, doubtless, to the excessive rainfall.

The tendency of Firbank wheat to lodge was in marked contrast to Federation, which was growing alongside in the buffer plots. The original Firbank wheat seed that was used was of particularly good quality.

Bunt Experiments at Wagga, 1916.

Exactly similar experiments were carried out at Wagga to those at Cowra, with the same samples of wheat, infected with the same samples of bunt spores at the same time. Five blocks, each one-tenth of an acre, were sown.

When inspected in November only two or three bunt-infected heads could be found in the whole of the check plot, and an infected head was found here and there in the four plots adjoining.

The experiment, therefore, yielded no information, except that certain weather conditions may prevent infected grain from producing an infected crop.

A dry or a moist seed-bed at the time of sowing, or a spell of warmth or frost at the time of germination, greatly influences the amount of infection of the growing grain that takes place.

Treatment of the Infected Grain.

All wheat grains were infected by shaking them up with an appropriate amount of bunt spores ; these spores were 2 years old.

Bluestone and Lime Treatment.—The grain was treated with a 1½ per cent. solution of copper sulphate for three minutes, then immersed in limewater for three minutes.

Formalin Solution.—The grains were immersed in a 0·5 solution of formalin for fifteen minutes, and then in water for fifteen minutes.

This weak solution was used because stronger solutions had in previous experiments so hardened the integument of the seed as to produce faulty germination. Again, according to Hecke, it suffices to wash fungus spores after treatment with formalin to redouble their vigour. This experiment, therefore, was designed to show (1) whether the spores of bunt are killed by such a weak solution as a 0·5 solution of formalin, or (2) whether treatment with formalin and subsequent washing in water invigorates the spores.

The experimental plot yielded only eight bunty heads in an area of one-tenth of an acre.

The reply to the first question is therefore in the affirmative, and that to the second question is in the negative.

Formalin Vapour.—The wheat grains were spread out on trays, the layers being only one seed deep. The trays were placed in a case that was almost airtight. They were then exposed to the vapour of formalin for forty-five minutes. The vapour was generated by the action of potassium permanganate on formalin. Formalin was used at the rate of 24 oz. per 1,000 cubic feet and potassium permanganate at the rate of 6¾ oz. per 16 oz. of formalin.* The vessel containing the formalin was surrounded by hot water to start the reaction.

According to Bourcart, the vapour of formalin has almost the same action as a fungicide as its dilute solutions.

Copper Carbonate.—The wheat was treated with 4 oz. of the dry powder per bushel in 1915, but in 1916 only 2 oz. per bushel were used. The result was eminently satisfactory.

Summary of Results.

	1915.	1916.
	Cowra.	
Check, untreated	Heavily infected	Heavily infected.
Bluestone and lime-water	No bunty heads	124 bunty heads.
Dry copper carbonate	No bunty heads	8 bunty heads.
	Wagga.	
Check, untreated	Heavily infected	No infection.
Bluestone and lime-water	3 bunty heads	No infection.
Dry copper carbonate	12 bunty heads	No infection.
	Cowra.	
Formalin solution		8 bunty heads.
Formalin vapour		Heavily infected.

In 1915, Comeback wheat was used.

In 1916, Firbank wheat was used.

In 1915, copper carbonate was used at the rate of 4 oz. to the bushel.

In 1916 ,, ,, ,, 2 oz. ,,

The conclusions of these experiments may be stated thus :—

1. That as the check plots were heavily infected at Cowra in 1915 and 1916, and at Wagga in 1915, useful comparisons can be made.
2. That dry copper carbonate, used at the rate of 2 oz. to the bushel of infected seed, gave better results than the standard method of dipping in bluestone and lime.
3. The use of gaseous formaldehyde gave unsatisfactory results, but the experiment has only been tried one year, and will be repeated with certain modifications.

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* These quantities are those recommended for the disinfection of rooms. Jordan, General Bacteriology, 4th ed., p. 85.

"Brown Spot" of Emperor Mandarins.

EXPERIMENTS IN ITS CONTROL.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

As indicated in a note in the December issue, the Department, during the last four years, has been conducting systematic experiments in the control of citrus diseases. The experiments were conducted at the orchard of Messrs. Brown Bros., at Erina, to whom the Department is much indebted for continuous help in the investigations. The work of pruning and spraying was carried out by Mr. Le Gay Brereton, Assistant Fruit Expert, and Mr. O. Brooks, Fruit Inspector.

In the previous note an outline of the experiments and the results arrived at was given. In the present article it is proposed to describe in greater detail the experiments of the last two years on the control of "Brown Spot" in Emperor mandarins.

The disease popularly known as "Brown Spot" of Mandarins, and sometimes as "Black Spot" (though it is quite distinct from the "Black Spot" disease of the orange) is due to a fungus, *Colletotrichum glœosporioides.*

The disease usually first manifests itself as a small brown spot upon the young fruit when about the size of a marble. The spot darkens in colour as the fruit ages. When about half grown the affected fruit begins to drop, especially after rain, and very few—even if only one minute spot is to be seen—hang on the tree to ripen. The popular and profitable Emperor mandarin is peculiarly liable to this disease, the control of which is therefore a great desideratum. The Thorny mandarin is seldom affected, although we have carried out experiments in the laboratory, when the spores of the fungus from Emperor mandarin readily infected the fruit of the Thorny variety.

The wood of the trees is attacked as well as the fruit. The threads or hyphæ of the fungus penetrate deeply into the twigs ; they are therefore little affected by sprays, and the only method of getting rid of them is to cut out the diseased twigs and burn them. When favourable conditions arise these fungal hyphæ produce abundant spores which readily spread infection to other parts of the tree on which they arise. We have isolated this fungus and grown it upon specially prepared media in the laboratory. Under these conditions it has been possible to follow its life-history. The fungal threads are very fine, and are white in colour. They grow quickly, and have the capacity of generating spore after spore at their extreme tips. The minute spores are ovoid, and are somewhat pink in colour. As they accumulate one sees little pink heaps of spores. They can be seen with the naked eye upon infected fruit or twigs if the weather be continuously wet. When dry, the little heaps of spores are scattered by the wind. The spores under favourable conditions germinate with extraordinary rapidity, an infection tube from a spore being produced in a few hours. The object kept in view, therefore, in the experiments was to rid the trees as far as possible of the disease by pruning, and then to prevent re-infection of fruit and twigs by the use of appropriate sprays.

A fungus identical with or closely allied to that producing the brown spot of the Emperor mandarin, is also found to infect oranges; it does not cause them to drop so easily, though it produces an unsightly "brown spot."

These fungi are very widely distributed in citrus orchards, far more widely than is generally supposed, and simply await favourable weather conditions to make themselves manifest as an epidemic.

Pruning.

At the outset, then, the necessity for pruning out dead and diseased wood and burning it was foreseen. The work of pruning out a citrus orchard, which has seen little of the secateurs previously, is a very tedious process. It is very slow work, and even when a tree has been gone over, and appears to be finished, careful scrutiny frequently discovers some small dead twigs still remaining to be cut out. Tedious as the work is, however, there can be no doubt that it pays, and pays better than spraying. The very source of the disease is attacked, and the trees, being opened up, become more vigorous and better able to withstand fungus attack; further, they are more easily sprayed. All prunings should be immediately burnt. In going over a tree it will sometimes be found that it can be improved by cutting out limbs of considerable size. The fruit is improved in quality and hangs on longer. Moreover, a diminution in the leaf area enables a tree better to withstand a dry season. In the case of oranges suffering from Maori, or lemons suffering from scab upon old trees, a marked improvement is frequently brought about by cutting out old limbs, better fruit being borne upon the new shoots through which the sap runs more freely.

Preliminary Trials with Fungicides.

All the trees having been pruned, certain materials presented themselves for selection as sprays. Any substance selected had to fulfil the following conditions:—It must be a fungicide, must not injure the foliage, and must be easily obtainable, cheap, and easy of application.

The substances selected for trial were Bordeaux mixture, lime-sulphur, formalin, copper sulphate, and potassium sulphide.

As little was known about the strength of the three lastnamed, which might be safely used on citrus trees, some preliminary experiments were made upon mandarin trees on 9th October, 1914.

Formalin.—The following strengths were applied on single trees :—

1 part of formalin to 80 water.
1 „ „ 96 „
1 „ „ 128 „
1 „ „ 144 „
1 „ „ 160 „
1 „ „ 192 „

The strength of 1 in 80 took a few leaves off the trees, but did not hurt the young growth.

Copper Sulphate.—The following strengths were tried upon single mandarin trees :—

Copper sulphate, 1 lb. to 100 gallons of water.
„ 1 „ 110 „
„ 1 „ 120 „
„ 1 „ 130 „
„ 1 „ 140 „

Potassium Sulphide.—The following strengths were tried upon single mandarin trees :—

Potassium sulphide, 1 oz. to 3 gallons of water.
„ 1 „ 3½ „
„ 1 „ 4 „
„ 1 „ 4½ „
„ 1 „ 5 „

Subsequent inspection showed that the following strengths could be used with safety upon mandarin trees :—

Formalin ... ... 1 gallon to 96 gallons of water.
Copper sulphate ... 1 lb. „ 100 „
Potassium sulphide 1 oz. „ 3 „

Comparison of Fungicides.

A large block of mandarins affected by Brown Spot was selected for experiment ; it was divided up into four subsidiary blocks.

On 6th November, 1914.—These were sprayed as under :—

Block I, 31 trees.—Bordeaux mixture, 6–5–50.

Block II, 30 trees.—Formalin, 1 volume to 96 volumes of water.

Block III, 24 trees.—Lime-sulphur (25° B), 1 volume to 20 volumes of water.

Block IV.—Two rows each of 6 trees in this block with copper sulphate, 1 lb. to 100 gallons. Two rows each of 6 trees in this block with potassium sulphide, 1 oz. to 3 gallons.

The mandarin trees were making splendid new growth. They had just set a heavy crop, and were in exactly the right stage for spraying.* The weather was hot and wet, and most suitable conditions prevailed for the development of fungi.

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* A tree that is just making new, vigorous growth is in a most suitable condition for spraying. It withstands the check given by the spray better than at other times, and the fungus spores being killed or checked upon the old growth, the new growth has a chance to expand without becoming fungus-infected.

On 23rd November, 1914.—The trees were again sprayed, this second spraying coating the young fruit much better than the first. No injury to the fruit or foliage was noticed from the former spraying.

In addition to the main crop—about the size of peas—the trees were carrying an intermediate crop about half grown. These latter, which had had no spraying, showed a certain amount of disease.

On 18th December, 1914.—The trees were again sprayed. In the second crop rather more disease was apparent in the blocks sprayed with lime-sulphur, Bordeaux, and formalin than in those sprayed with copper sulphate and potassium sulphide. To ascertain if fewer sprayings would be sufficient, the top row in Block I (Bordeaux mixture) and Block III (lime-sulphur) were not sprayed.

On 14th January, 1915.—It was intended to spray the trees again, but some of the second crop mandarins showed signs of scald; this was specially the case with those sprayed with lime-sulphur. Those sprayed with formalin, with copper sulphate, and with potassium sulphide showed it in a less degree. Partly on this account, and partly because it was necessary to spray the trees with soda for wax scale the customary sprays were not given. Six trees, however, were sprayed with Bordeaux 6–5–50, with the object of testing whether these later sprays were of any use in controlling the disease.

In estimating the value of a spray, one is met with this difficulty, unless he is continually on the spot. The spotted fruit is the first to drop; this is gathered up and burnt by the orchardist, and from that which remains on the tree a correct estimate cannot be formed of the actual amount of disease that has been prevalent.

In designing these experiments, no trees were left unpruned or unsprayed, either in the actual experimental blocks or in the area surrounding them. However desirable it may be to have such trees as checks, the objection that throughout the course of the experiment they may be a continual source of re-infection is insurmountable, and they were purposely left out.

A comparison was therefore made of the Emperor mandarin trees (which had not been sprayed or pruned) in three orchards in the Gosford district. These showed that, both on the main crop and the second crop, more disease was prevalent than in the treated trees in Mr. Brown's orchard.

Also, in Mr. Brown's orchard, a block of Emperor mandarins which did not receive an early spraying and one tree that received no spray, distant from those under experiment, showed more disease on the young main crop than those under treatment. Two Emperor mandarin trees, however, growing in an orange bed, that were unsprayed did not show more disease than those under treatment. In the second-crop fruit then beginning to colour, there was very little difference in the amount of disease between the sprayed and the unsprayed trees. As regards the main crop, the trees sprayed with Bordeaux mixture gave the most promise.

On 5th February, 1915, an inspection of the trees showed that the main-crop fruit in all the sprayed plots was very free from disease. The older second-crop fruit showed some spot; but there was little or no difference between those receiving the different sprays, as far as the second-crop fruit was concerned. Another bed of Emperor mandarins, in the same orchard, which was not included in the experiment showed more disease than the treated trees.

On 7th May, 1915, a final examination of the trees was made. It was found that of the main crop remaining upon the trees, those treated with—

1. Bordeaux mixture were very free from spot.
2. Formalin mixture were very free from spot.
3. Lime-sulphur showed more spot than 1 and 2.

4A. Copper sulphate showed very much more spot than 1 and 2.

4B. Potassium sulphide showed very much more spot than 1 and 2.

The whole of the treated area was distinctly more free from spot than a bed that had received no early cutting out or early spraying, this latter showing fully 40 per cent. of spotted fruit.

Conclusions from 1914-1915 Experiments.

1. Pruning and cutting out and burning all dead and diseased wood is the most important factor in controlling disease. This pruning should commence as soon as the main crop is off.

2. Early sprayings just after blooming are the most effective in controlling the brown spot disease of Emperor mandarins.

3. Bordeaux mixture, 6-5-50; and formalin, 1 in 96, were the most effective sprays used, being followed by lime-sulphur (25° B), 1 in 20. Copper sulphate, 1 in 1,000, and potassium sulphide, 1 in 480, were not as effective as the previous sprays.

4. Both formalin and lime-sulphur of the strength used produced a certain amount of spray-injury upon second-crop mandarins when about half grown, in sunny weather in December.

The 1915-1916 Experiments.

It was decided this season to discontinue further experiments with copper sulphate and with potassium sulphide, the trees formerly subjected to this treatment being sprayed with formalin solution, 1 in 96. In making the Bordeaux mixture, just sufficient lime was added to combine with all the copper.

On 12th August, 1915.—The trees which had been the subject of experiment in the season 1914–1915 were, with the exception noted above, again sprayed as in the previous year, *i.e.*, with Bordeaux mixture, 6–4–50, lime-sulphur 1 in 20, and formalin 1 in 96.

On 23rd December, 1915.—The whole of the trees were sprayed with Bordeaux mixture, 6-4-50. The reason for this was that some experiments which had been conducted during the season 1914-1915 with Bordeaux mixture, lime-sulphur, and formalin for the control of the Black Spot disease of the orange, had shown Bordeaux mixture to stand out so pre-eminently as a fungicide over the other two that it did not seem desirable to devote further time to the trial of lime-sulphur and formalin.

On 4th February, 1916.—Block I was sprayed with Bordeaux, 3-2-50. Previous treatment, Bordeaux, 6-4-50.

Block II was sprayed with Bordeaux, 6-4-50. Previous treatment, formalin, 1 in 96.

Block III was sprayed with Bordeaux, 3-2-50. Previous treatment, lime-sulphur, 1 in 20.

Block IV was sprayed with Bordeaux, 6-4-50. Previous treatment, formalin, 1 in 96.

In addition, all the blocks had been sprayed with Bordeaux mixture, 6-4-50, on 23rd December, 1915.

On 6th May, 1916.—Inspection of the treated blocks showed that they were very free from Brown Spot, only a very occasional fruit was found attacked. Block I, which had been treated right through the season with Bordeaux mixture, showed better than the other three blocks.

On 7th July, 1916.—A further inspection showed the trees to be particularly clean, Block I being particularly so.

Spraying orange trees too frequently with Bordeaux mixture of a strength 6-4-50 gives them a hard appearance, and the growth and fruit are somewhat adversely affected. Mandarin trees, on the other hand, which were sprayed throughout the two seasons under review with Bordeaux mixture of this strength, showed no ill effects. More red scale made its appearance on the trees sprayed with Bordeaux than on the unsprayed trees.

General Conclusions.

1. Pruning and cutting out and burning all dead and diseased wood is the first essential in the control of the disease.

2. For the control of Brown Spot in Emperor mandarins, Bordeaux is an excellent spray.

3. It may be applied to these trees, without injury, of a strength 6-4-50.

4. Once the disease has been got under control, a spray of half this strength may be used.

5. Early spraying is most essential.

6. Red scale shows a tendency to increase upon trees frequently sprayed with Bordeaux mixture.

SUMMARY OF SPRAYING EXPERIMENTS ON "BROWN SPOT" ON MANDARINS AT MESSRS. BROWN'S ORCHARD, ERINA—1914-1915.

Date.	Block.	Mixture.	Strength.	No. of Trees.	Weather Conditions.	Remarks.
Spraying 6 Nov., 1914.	1	Bordeaux	6-5-50	31	Hot and wet	No injury to fruit or foliage.
	2	Formalin	1 in 96	30	,, ,,	,, ,, ,,
	3	Lime-sulphur	1 in 20	24	,, ,,	,, ,, ,,
	4a	Copper sulphate	1 in 1,000	12	,, ,,	,, ,, ,,
	4b	Potassium sulphide	1 in 480	12	,, ,,	,, ,, ,,
23 Nov., 1914.	1	Bordeaux	6-5-50	....	Hot and sunny	Second crop showed signs of disease.
	2	Formalin	1 in 96	....	,, ,,	....
	3	Lime-sulphur	1 in 20	....	,, ,,	....
	4a	Copper sulphate	1 in 1,000	....	,, ,,	....
	4b	Potassium sulphide	1 in 480	....	,, ,,	....
18 Dec., 1914.	1	Bordeaux	6-5-50	....	Bright and sunny	1 row unsprayed. 1 ,, ,, Main crop clean. Second crop showed rather more disease in the Bordeaux, lime-sulphur, and formalin blocks than in the other two.
	2	Formalin	1 in 96	....	......	
	3	Lime-sulphur	1 in 20	....	......	
	4a	Copper sulphate	1 in 1,000	....	......	
	4b	Potassium sulphide	1 in 480	....	......	
Inspections 14 Jan., 1915.	1	Bordeaux	6-5-50	1 row of 6 (trees only).	......	Most promising of the treated trees.
	2	Formalin	.....	....	......	Sprays not applied, as second crop on trees sprayed 18th December showed signs of scorching.
	3	Lime-sulphur	....	.. .	......	
	4a	Copper sulphate	....	....	......	
	4b	Potassium sulphide	....	....	......	
7 May, 1915.	1	Bordeaux	6-4-50	31	. ....	Very free from spot.
	2	Formalin	1 in 96	30	......	Showing more spot than 1 or 3.
	3	Lime-sulphur	1 in 20	24	......	Very free from spot.
	4a	Copper sulphate	1 in 1,000	12	......	Showing very much more spot than 1 or 3.
	4b	Potassium sulphide	1 in 480	12	......	

SUMMARY OF SPRAYING EXPERIMENTS ON "BROWN SPOT" ON MANDARINS AT MESSRS. BROWN'S ORCHARD, ERINA—1915-1916.

Date.	Block.	Mixture.	Strength.	No. of Trees.	Weather Conditions.	Remarks.
Spraying— 12 Aug., 1915	1	Bordeaux	6-4-50	31	....	
	2	Formalin	1 in 96	30	....	
	3	Lime-sulphur	1 in 20	24	....	
	4	Formalin	1 in 96	24	....	
23 Dec., 1915	1	Bordeaux	6-4-50	31	....	
	2	,,	,,	30	....	
	3	,,	,,	24	....	
	4	,,	,,	24	....	
4 Feb., 1916	1	Bordeaux	3-2-50	31	....	
	2	,,	6-4-50	30	....	
	3	,,	3-2-50	24	....	
	4	,,	6-4-50	30	....	
Inspections— 6 May, 1916	1	Bordeaux	....	....	....	All the blocks remarkably clean, Block 1, which had been treated throughout the season with Bordeaux, being particularly so.
	2	,,	....	....	....	
	3	,,	. ...	....	....	
	4	,,	....	....	....	
7 July, 1916	1	Bordeaux	....	....	....	As above.
	2	,,	....	....	....	
	3	,,	....	....	.. ....	
	4	,,	....	....	....	

Holsteins at Berry Experiment Farm.

J. G. McMILLAN, Manager.

IN the last issue it was mentioned that, under the new policy of the Department, Berry was allotted two breeds of cattle, viz., Shorthorns and Holsteins, the latter because of the nature of the farm, and also its geographical position. The pastures consist in a large measure of English grasses, which are so necessary if the best success is to be achieved with this breed.

The Holstein can justly claim to have the most extensive family tree of any dairy breed of cattle. Their history can be traced back for several hundred years, and for almost as many years has their home, Holland, been noted for its dairy products. Even in those days the Dutch were noted, not only for the quality, but also quantity in this direction. When British breeders began to consider the question of improving the milking qualities of their herds, the fame of the Dutch cattle was known. This naturally created a desire on the part of the Britisher to emulate the Dutchman ; and thus it is generally recognised that Booth, who was responsible for the improvement of the old Teeswater cattle, used Holstein sires on selected cows.

The Dutch can fairly well claim to be the pioneers in the improvement of dairy cattle, their one aim being to produce milkers. By careful selection and skilful mating they have been able to produce what may justly be claimed the heaviest milking cattle in the world. We are told that all cows must give at least 1,000 gallons during the one period of lactation, otherwise they are culled out.

It is also said that the Dutch farmer of the present generation has set his mind on the improvement of the fat test in Holstein milk, and to do so has introduced some Channel Island stock. If this is the case, we may some years hence find that the calves of the breed may not be as true as they are now. Even at present there are instances of red and white progeny from sires and dams whose pedigrees can be traced back as absolutely pure for several generations. About a year ago one of our very best cows dropped a red and white bull, and visitors on viewing him pass various opinions as to his breed, some classifying him as Ayrshire, others as Shorthorn. It is a well known fact, however, that in all Holstein herds there are occasional instances of this reversion. The manager of one of the largest dairying estates on the South Coast prefers to have the red and white Holstein bull to the black and white, provided his dam is good.

This mention of colour brings up the question of what is the proper colour of the Holstein. Some breeders prefer to have a predominance of black. In America it is considered that the more white in the cow the better the quality of the milk. I cannot say that the latter can be taken as a fixed law, as of the two highest-testing cows we have one has a preponderance of white, whilst the other is almost totally black. Personally I do not think that the colour has any material effect upon the quality of the milk. I consider, however, that the more equally the white and black end abruptly against each other the more showy the animal. We will find amongst breeders of this animal as many faddists in respect to this subject as among the Jersey or Ayrshire fanciers.

That the Holstein is a deep producer of milk under suitable conditions no one can deny, but we have to admit that, as a rule, the fat percentage is rather low. We have instances, however, of tests showing over 5 per cent. fat, but this is high. Taking the milk in the bulk, however, there is very little danger of the dairyman, who sells milk in towns, being prosecuted, as the solids not fat are high in proportion to the fat. Now, as we find at Berry certain Holstein cows yielding milk of a persistently high test, we are keeping a bull from one of these to mate with females with the object of raising the fat percentage. By careful selection and careful line-breeding there seems to be no reason why the Holstein should not take a high place amongst the breeds for rich milk. To the rather low fat percentage may be attributed a great deal of their unpopularity. Black and white cows are also looked upon by most dairymen as aliens, and often for the colour alone good cows are culled out.

Many of the dairy breeds are adaptable to almost any class of country, and although such respond liberally when fed on rich pastures, on poorer country they will milk fairly well. This quality cannot be claimed for the Holstein ; she must have the best of pasture if the best results are to be obtained ; on poor land to keep her is a waste of money. The natural habit of this breed seems to have descended to all generations. In Holland the pastures for several months in the year are probably unequalled, there being a bountiful growth of mixed grasses which allows of the animal obtaining a stomachful within a small radius. Thus most of her food goes to the production of milk, the minimum being expended in muscular energy. When the grasses through climatic conditions become dormant the cow is housed, fed liberally with bulk fodder such as meadow hay, turnips, cabbages, mangolds, &c., also concentrated foods, such as cotton cake, linseed cake, bean meal, &c. ; thus by such treatment she has become almost mechanical, for the more that is put in at the mouth the greater the volume of milk. If we therefore hope to develop the best qualities of the Holstein we must treat her as well as she has been in her native land, although, of course, as regards housing, such in most parts of New South Wales is unnecessary ; nevertheless, during the colder period of the year rugging should be resorted to in most districts.

It is about twenty years since the first Holsteins were imported by the New South Wales Government. Several private gentlemen throughout the Commonwealth also imported. One of the largest herds I have seen was that of the late Mr. David Mitchell, of Lilydale, Victoria. He had a herd of over 100, consisting of both pure-breds and grades. This gentleman had a farm which suited the requirements of the Holsteins, and although he showed the very best of results the breed has failed to become popular in the southern State. The late Dr. Hay, of Coolangatta, and also Mr. Pritchard,

Broughton Mill Creek.

HOLSTEINS AT BERRY EXPERIMENT FARM.

of Nowra, went fairly extensively into the development of this breed in order to raise them in popular estimation. The Government placed an imported bull, "Bosch," at Wollongbar Experiment Farm, leasing the animal to farmers. On the Tweed River there is a considerable mingling of the breed amongst the dairy herds of the present day, and this may account for the fact that we have had a number of orders recently for bulls from dairymen in that district. Evidently the strain of Friesian blood in some of his stock is making the farmer conclude that further fusion will stimulate the production of his herd. Personally, I have always been doubtful of the suitability of the Holstein for the Northern River districts, but evidence is being shown that such an impression was not conclusive. It will be interesting to follow the success or otherwise of those dairymen who have recently purchased sires. My own recommendation to the beginner in dairying would be to keep cattle that would not only be adaptable to the class of country, but also adaptable to the purpose to which he intended devoting the milk supply. If quantity of milk is required for town supply, or if cheese or condensed milk making is the objective, then for any of these—given suitable surroundings as regards feed already mentioned—the Holstein is well adapted. The Bodalla Estate has gone in fairly extensively for the breed, as all milk is converted into cheese; and as this brand of cheese bears a famous name, it bears out my contention that Holstein milk is excellent for the manufacture of this product.

All the world over, at least in the principal dairying countries, Holstein cattle are receiving more consideration year by year. Twenty years ago to find representations of this breed in the British Isles was almost an impossibility. About three years ago, however, the British Holstein Society approached the then President of the Board of Agriculture with the request that he relax the regulations in regard to foot and mouth disease, so as to enable animals from Holland to be imported. Amidst protests from the breeders of other animals, the Minister granted the request. Something like ninety animals, male and female, were purchased. A sale was held, and animals, which were purchased for comparatively small sums, none reaching three figures, were sold for as high as £300. Such keen competition, therefore, shows that the conservative British farmer is beginning to show great practical interest in the breed. In America, also, we read from the dairy journals of that country that the popularity of the Holstein is increasing rapidly; and the fact that some time ago £3,000—the highest price ever realised for a dairy bull—was given for King Segis, shows that our American cousins are keen on this breed. The records of some Holstein cows in the United States of America have been somewhat phenomenal. Nothing like it has been approached in this country, but there is no reason why, if we cared to spoon-feed our special test cows as the American does, that equally high records should not be reached.

Coming nearer to Australia we see that many of the New Zealand dairymen are introducing the Holstein-Friesian. No doubt this is due to a great extent to the fact of such a large quantity of the milk produced in that country being converted into cheese, which, as we all know, is world renowned.

Queensland may rightly claim to have more Dutch cattle than any of the other Australian States. As Queensland has, like New Zealand, gone largely in for the manufacture of cheese as well as condensed milk, this may explain the reasons for the expansion in popularity of this breed. The Nestle's Milk Co., for example, have considerable herds of so-called "magpie cow."

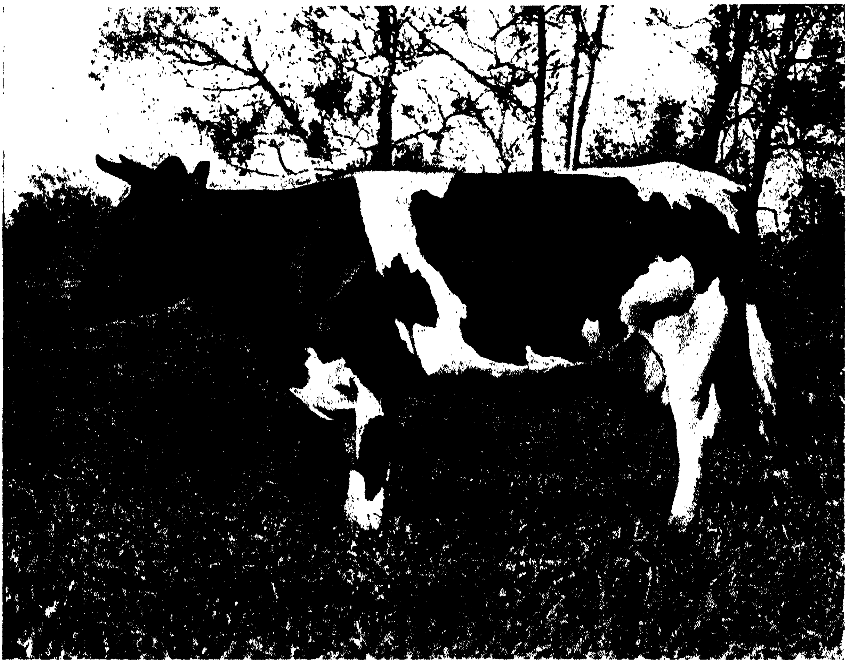
The Australian Holstein Herd Book will shortly be published, and will include pedigrees of the Government stock at Berry. A few weeks ago the official examiner came to inspect the Holsteins at this farm. To show the wrong impression that some people get, and are made to believe, about Government stock, it may be mentioned that this gentleman, who is a well known authority, said that he was agreeably surprised at the quality of the herd (there being only one animal that he objected to), as he was informed before coming that he would not see a good cow on the farm. It will be seen from these notes that there are many good Holsteins at Berry, animals, in fact, that can be raised to a high standard of perfection.

Sultan La Polka (imp.).

Sire, King of Dominoes, 297 N.Z. and F.H.B., from Princess La Polka, 292 N.Z. and F.H.B.

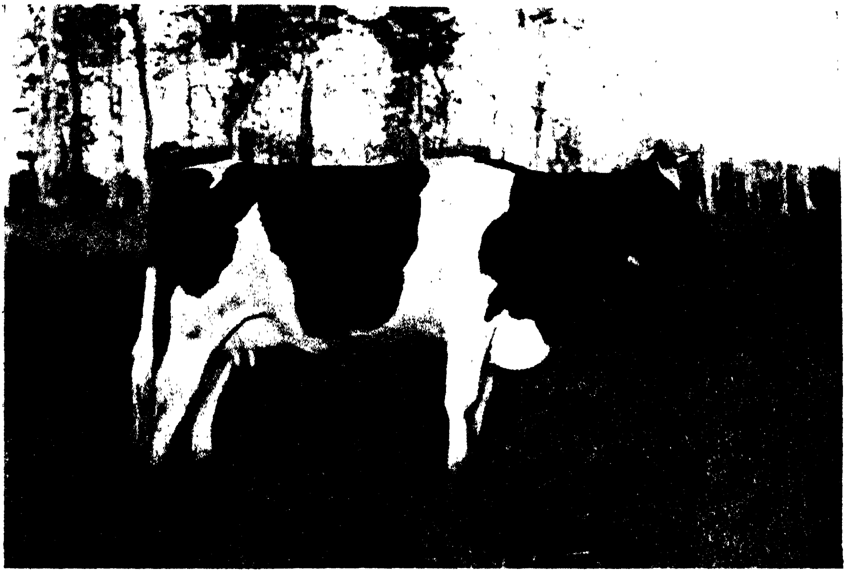
At the head of the herd stands Sultan La Polka (imp.), an animal just about 3½ years old. He was bred in New Zealand by Mr. J. Lovelock, and was brought over to Sydney Royal Show with other animals of his breed in 1915. He won first in his class at that exhibition, and was purchased for this farm. He is by King of Dominoes (297 N.Z. and F.H.B.), from Princess La Polka (292 N.Z. and F.H.B.). Both the sire and dam have great Show records in New Zealand. King of the Dominoes is by King Segis, Wild Rose Homestead, imported from America. As the King Segis strain is considered the very best, we should be able to get some first-class stock.

Sultan La Polka is an animal of great length; the back line is good, and particularly so at the chine. He has remarkably fine bone for a Holstein. The thighs are nice and flat; the skin loose and silky; head masculine, neck strong and free from superfluous dewlap; brisket light; chest wide. The escutcheon is large and fine, whilst the skin around the genital parts is silky to the touch. Teats are large, and milk veins well developed. The barrel is long and well sprung, but, as is often the fault with very lengthy bulls, he is somewhat deficient in depth. This slight defect, however, does not appear in his progeny, as all his calves, which are of course young, are showing remarkably deep barrels. There is every evidence that we have a sire that will make good. Recognising the general rule that "the bull is half the herd," we want to assist him in his work of improvement by mating him with good females, of which the farm possesses some fine animals.



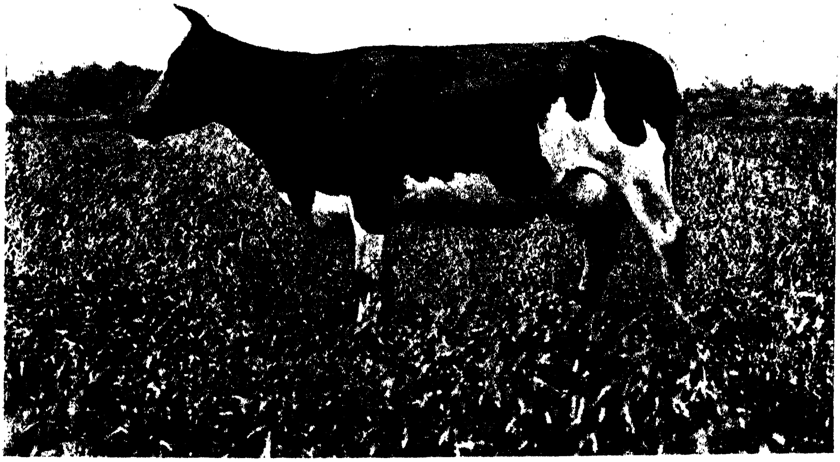
Folkein of Berry.
Sire, Hollander; dam, Folkje II (imp.).

Folkein of Berry (85), sire Hollander, dam Folkje II (imp.), by Folsgrave 4th, is, as the illustration shows, a typical dairy cow. She possesses the wedge shape; has a good spinal column; droops slightly at the rump (a fault often found in Holsteins); the barrel is long, deep, with well-sprung ribs. Her udder is of excellent shape, extending well up behind and forward; there is absolute freedom from fleshiness; teats are large and well placed, veins showing prominently over the whole surface of udder; milk veins are large and tortuous. The escutcheon is a typical flandrine. The bone is excellent, fine and flat. The illustration shows the flatness of thigh and arch



Folkje 3rd of Berry.

Sire, Field Marshal; dam, Folkein of Berry.



La Hook II.

Sire, Froxfield Chevin (imp.); dam, La Hook.

HOLSTEINS AT BERRY EXPERIMENT FARM.

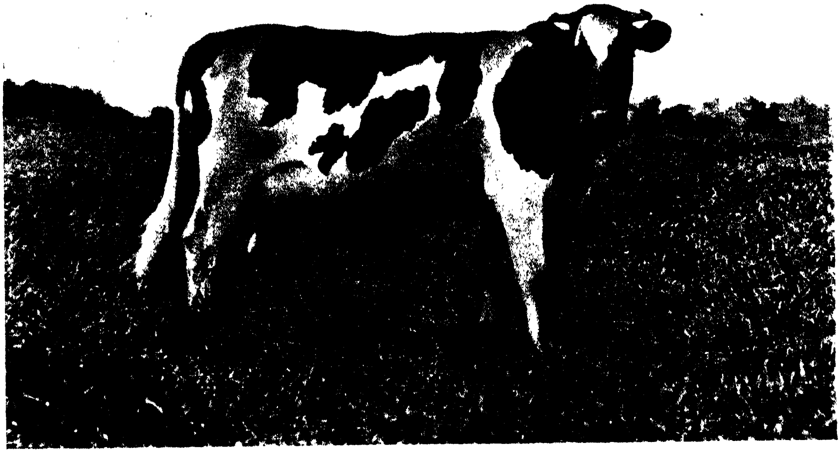
in the flank. The skin is glossy and loose. In every way is Folkein a desirable breeding cow from which to obtain good stock. Her last computed record was 8,620 lb. milk and 334·45 lb. butter in 273 days. She calved in November last, and for that month yielded 1,369½ lb. milk and 61·71 lb. butter; December, 1,380 lb. milk and 64·2 lb. butter; January, 1,200 lb. milk and 45·6 lb. butter. Folkein's dam, Folkje II, yielded 8,044 lb. milk and 310 lb. butter in 306 days.

Folkein has a daughter, Folkje III, which has recently come to profit. An illustration is given of this nice young female, and indicates that she is a typically marked beast. She is milking well, her yield for January being 907½ lb. milk and 43·56 lb. butter. Unfortunately, she had a growth inside one of the teats, which detracted from her performance. Folkje III is by Field Marshal, by De Wet ex Lolkje Field.

La Hook II, on her second calf, is another cow that is doing particularly well; this lactation for November, December, and January she gave 1,369½ lb., 1,365 lb., and 1,065 lb. milk and 67·65, 62·1, and 42·3 lb. butter respectively. On her first calf she gave 5,212 lb. milk and 223 lb. butter. La Hook II is by Froxfield Chevin (imp.) from La Hook by Hollander. The grandmother of La Hook II, Queen Margaret, gave 7,558 lb. milk and 387 lb. butter in nine months, whilst her great grandmother, Margaretha (imp.), gave 10,904 lb. milk and 407 lb. of butter in 325 days. This young cow shows every prospect of making good. Her bull calf was sold quite recently to a dairyman on the Manning. She is a cow of a very tranquil nature and shows true dairy characteristics.

In Double Dutch of Berry we have a typical Holstein of large frame, showing great capacity for food, skin that is loose and silky, temperament in every way desirable, showing no superfluity of flesh. The udder is one that when once empty folds like a glove. This cow is by Hollander from Dutch Oven, by President. She yielded in 273 days 8,470 lb. milk and 346 lb. butter. Her dam, Dutch Oven, yielded 8,671 lb. milk and 365 lb. butter in 329 days. The latter cow was sold for 100 guineas at the Sydney Royal Show. The grandmother of Double Dutch was Margaretha (imp.).

Lolkje Amster of Berry may be termed one of our best. She is a beast of great size. The back line is particularly good, the spinal column being very prominent, whilst the rump is square and level. She has great depth, length, and width of barrel. The bone is fine and flat, skin silky and loose, the udder is of ideal shape and milks well out, teats are large and well placed, escutcheon a flandrine of the first order. A bull from this good cow, Duke of Amsterdam, by Nietenstein, was recently purchased by a Queensland firm, and won the championship at the last Brisbane Show for the best Holstein male. Lolkje Amster yielded in 273 days 8,469 lb. milk and 360 lb. butter, with an average test of 3·7. Lolkje Amster is by Amsterdam, by Garfield (imp.) ex Lady Margaret, dam Lolkje, by Joubert from Lolkje Veeman (imp.). Joubert was by Obbe (imp.). Lolkje Veeman yielded 9,708 lb. of milk and 407 lb. of butter in 301 days, and the year following she gave 11,960 lb. milk and 479 lb. butter in 342 days.



Double Dutch of Berry.

Sire, Hollander ; dam, Dutch Oven.

Lolkje Amster of Berry.

Sire, Amsterdam ; dam, Lady Margaret. Yielded 8,469 lb. milk, containing 360 lb. butter, in 273 days.

HOLSTEINS AT BERRY EXPERIMENT FARM.

Miss Muller of Berry is another cow that is outstanding. Her sire is Hollander, dam Margosa, by Garfield (imp.). Miss Muller's yield for 273 days was 8,700 lb. milk and 337·29 lb. butter. During the present lactation period she yielded up to 7 gallons of milk with a 3·2 test per day. Margosa, her mother, is of a good type, her grandmother being Margaretha (imp.). We have several of Margosa's stock, all of which are good.

Bircham is another cow worthy of mention. She is an instance of a high tester. For January of this year she yielded 1,254 lb. milk, producing 62·7 lb. butter, the average test being 4·5 per cent.

Miss Muller of Berry.

Sire, Hollander; dam, Margosa. Yielded 8,700 lb. milk, and 337·29 lb. butter in 273 days. Yields as high as 7 gallons per day.

A heifer that only recently calved, viz., Fraulein, from Fraulein Arama, shows great promise. For January last she yielded 907½ lb. milk, containing 49·17 lb. butter, the average test being 4·6 per cent. Fraulein Arama had been calved six months up to January, and for that month yielded 990 lb. milk, containing 38·4 lb. butter.

In this article I have endeavoured to show that the Holsteins have many good points. The reader will see that some of them produce very rich milk, comparing favourably with those of other breeds. The Dutch cow is generally of a docile nature; it is very seldom that any of them will be found stiff to milk, and fleshy udders are a negligible quantity. As beef cattle they are not at all a desirable type; indeed, a Holstein that is fat is always deficient at the bucket. The beef, however, is of fairly good quality, but there is a large percentage of offal to flesh.

For crossing with some other breeds considerable success has been achieved. With the Shorthorn, the milking qualities of that breed are improved. The union with the Ayrshire results in progeny which are deep milkers, and the cross improves on the teats of that breed. The milk of this cross is of average quality. With the Jersey, some excellent milkers have been produced, although the mating of a Holstein with Jersey cows is accompanied with a certain amount of danger, the cows often having difficulty at parturition. The cross, however, results in increasing the quantity of milk on that of the Jersey, whilst as compared with the pure Holstein the fat percentage is increased. With the Guernsey, it was hoped that the progeny of such a union would result in the production of deep milkers. Theoretically this should be the case, but theory has not been borne out in practice.

The dairyman who intends embarking on trials with Holsteins in his herd should carefully consider the main points indicated in this article as regards feed, &c., if he hopes to attain success.

"PIGS AND THEIR MANAGEMENT."

A SECOND EDITION.

THE practice of marketing as much as possible of the produce of the farm in the form of animal products instead of as crops, has often been recommended to farmers, but personal interest probably never pointed the way more clearly than at present. Prices and prospects for cereals, in particular, are no doubt good, but those for wool, mutton, hides, beef, butter, &c., are even better, and the progressive farmer may even feel embarrassed by the number of opportunities for profitable development of the method. From some there will come the objection that capital is required, but one class of live stock can be mentioned in which the initial outlay need not be large, while the returns are early and appreciable. Pork and bacon are both high in price, and likely to remain so. On the other hand, pigs can make profitable use of much that would otherwise be wasted. We have recently learned how damaged grain was fed to pigs at Hawkesbury Agricultural College with good results. Those same high prices for pork, moreover, might well suggest to farmers in certain localities how they could grow maize with pecuniary advantage to themselves.

These reflections are suggested by the publication of the second edition of "Pigs and Their Management," by Mr. H. W. Potts, Principal of Hawkesbury Agricultural College. The first edition had a very appreciative reception in 1911, and copies have been unobtainable for a considerable time, so that the present appearance (with the revision consequent upon five or six years' experience) is welcome and timely.

"The main objects of the book," says the author in his preface, "are to provide in a readable form material which focuses Australian practice and conditions favourable to pig-raising. It is designed to meet the requirements of the actual breeder and feeder, to guide the uninitiated as a work of reference and to act as a text-book conveniently arranged for the agricultural student.'

The care of the animals, the various breeds, the feeding, and production of feeding crops, construction of sties, slaughtering, curing, and diseases, together with a statistical appendix and an index, fill 192 pages.

The book is liberally illustrated, many of the blocks being particularly good reproductions of typical specimens of the various breeds. The Government Printer is responsible for the production, and the result reflects the greatest credit upon his staff.

The book is substantially bound in an attractive cloth cover, and may be obtained from the Government Printing Office at 5s. (postage, 2d. extra).

Poultry Standards in their Relation to Utility.

JAMES HADLINGTON, Poultry Expert.

THE greatest disability under which the utility poultry-farmer, who wishes to improve the character and physique of his flocks, is working is the want of knowledge of the requirements for standard-bred birds, and some ready method by which he can acquire this knowledge.

It might be well to dispel a prevailing erroneous idea in regard to pure-bred birds. A bird may be pure-bred, but still fall very far below standard requirements for the breed in regard to its most essential features of type and character. This error is responsible for much of the degeneracy noticeable in different breeds to-day. Once this fact is grasped the necessity for some standard of excellence, which has been set up by some constituted authority, will become apparent as a means by which birds may be judged for type and character; in other words, a guide to standardisation.

Unfortunately the term "standard-bred bird" has become to the poultry-farmer synonymous with "show bird," which is anathema to him. The real trouble, however, is that the utility man does not require the fancier's interpretation of the standard when such interpretation runs to exaggeration. But he nevertheless requires a standard by which to measure the quality and retain the character of the breeds he keeps.

True, the poultry standards as set out by the English Poultry Club are available to him, but the forms in which they are presented are not nearly as explicit as they might be, and what is worse, they lack diagrams truly depicting what the outline of the bird should be; but even such would convey a poor idea compared with photographic work. Illustrations with artist's drawings are common enough, especially in American publications, but these, too, leave much to be desired in their depiction of type and character; in fact, many that one sees are often very wide of the mark.

In an endeavour to remedy this deficiency I have secured photographs of living subjects of some of the breeds. I am aware that in some quarters it is possible that these might be considered "show birds," for which the utility man has no time. To remove such an erroneous impression it may be stated that the originals of these photographs are show birds only in so far as they represent the type and character of their particular breed, but they are no less utility birds of the highest quality, and have been bred for that purpose, and not for show.

It is a recognised thing to seek to improve our flocks and herds by standard-bred animals in such cases as, for instance, the horse, cow, sheep, and pig. These are not discounted as regards their utility qualities, simply because they are standard-bred animals; then why a different attitude towards utility? All that we require is to be secured in pure breeds which are capable of responding to the highest aspirations of the utility poultry-farmer, and represent his only means of improvement if pure breeds are his objective. It may suit farmers who are carrying a low standard of quality to decry standard specimens; but it should be remembered that when standards are ignored degeneracy from original type and character is swift and sure. For instance, a bird is not a Black Orpington merely because it is black; or a White Leghorn because it is white; neither will high fecundity or size constitute either one or the other. But they belong only to the breed in proportion as they conform to the standards laid down for that breed.

The standard for each breed is therefore given here, together with photographs which represent the writer's interpretation of those breeds as near as he is able to obtain photographs to illustrate them, keeping in view the true utility character of each breed. It is intended to deal similarly with other breeds at a later period.

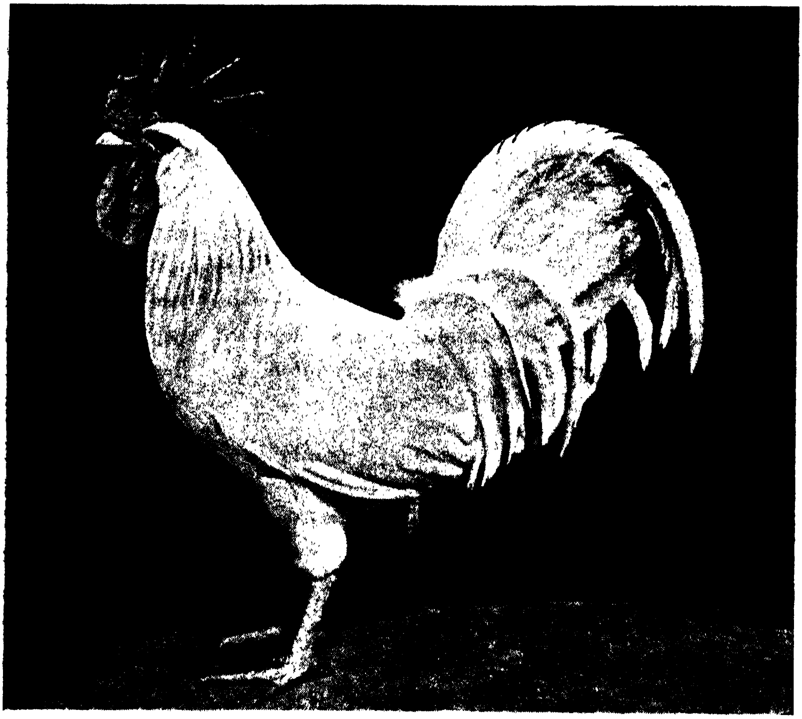
I refrain from including the scale of points as set out in the English standards, because it is considered that they are scarcely compatible with the object of this article, which is standardisation with a view to the utility character of the birds, owing to the value given to mere fancy considerations. Particularly is this the case in regard to White Leghorns. In this connection I have repeatedly expressed the opinion to both judges and exhibitors that the scale of points should be revised and brought more in accordance with utility considerations. However, it should be understood that the value given to particular points and the broad description of the standard requirements in other respects, need not be taken in conjunction, *i.e.*, quite different values might be given to make up the bird as described in the body of the standard, greater weight being given to utility and less to fancy considerations. To make this quite clear one instance will suffice. In the scale of points for White Leghorns, as set out in the English standard, fifteen points are allowed for ear-lobes, and the same number for size and for shape. From a utility point of view this is an absurdity.

ENGLISH STANDARD FOR WHITE LEGHORNS (SINGLE COMB).

General Characteristics.

COCK.

Head.—Skull: Fine. Beak: Stout, the point clear of the front of the comb. Comb: Single, of fine texture, large, but not overgrown, perfectly straight and erect, deeply and evenly serrated, the spikes broadening at the base, extending well beyond the back of the head, and following, without touching, the line of the hackle; free from thumb marks and side sprigs. Face: Smooth and of fine texture, and free from wrinkles or folds. Wattles: Long, thin, and of fine texture. Ear-lobes: Well developed and rather pendant, equally matched in size and shape, smooth, open, and free from folds.



White Leghorn Cock.

Neck.—Long, and well furnished with hackle feathers.

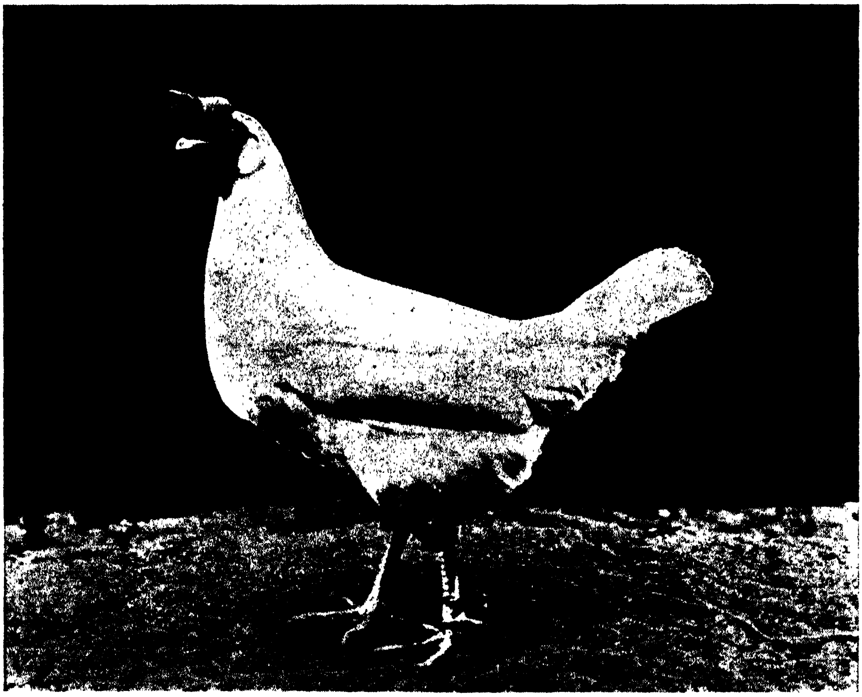
Body.—Wedge-shaped, wide at the shoulders, and narrowing to the root of the tail. Breast: Round and prominent, the breast-bone straight. Back: Slightly rounded and sloping to the tail. Wings: Large, but tightly carried.

Tail.—Moderately full, carried at an angle of 40 to 45 degrees.

Legs and Feet.—Legs: Fairly long, the shanks free from feathers. Toes: Four, long, straight, and well spread.

Carriage.—Very alert and sprightly.

Weight.—6 lb. to 8 lb.*



White Leghorn Hen (a good laying type).

HEN.

With the exception that the comb falls gracefully over to either side of the face, and the tail is carried closely and not at such a high angle as the cock's, the general characteristics of the hen are similar to those of the cock, allowing for the natural sexual differences.

Weight.—5 lb. to 7 lb.*

COLOUR.

White.†

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* See reference to weights in separate paragraph on page 216.

† Not straw colour.—J.H.

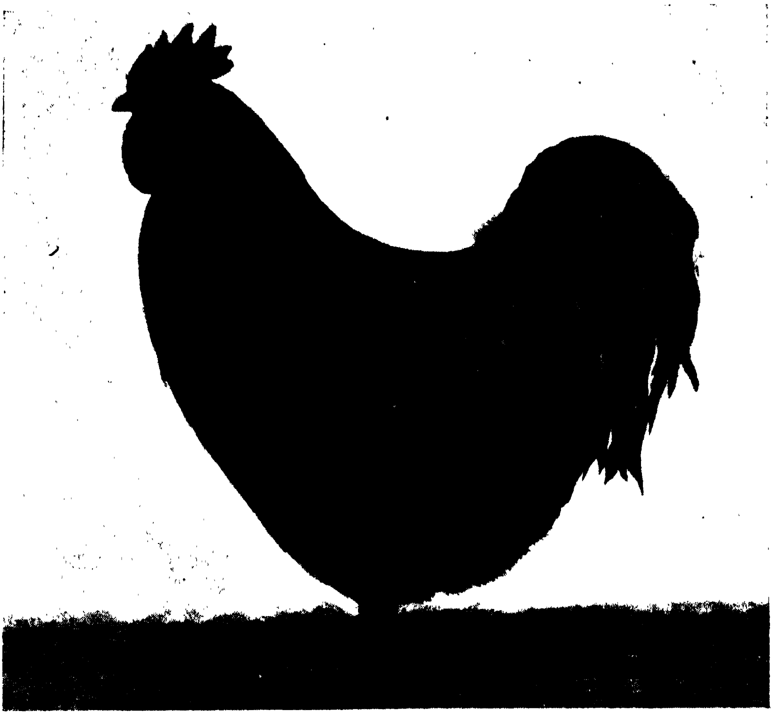
ENGLISH STANDARD FOR BLACK ORPINGTONS.

General Characteristics.

COCK.

Head.—Skull: Small and neat, and fairly full over the eyes. Beak: Strong, and nicely curved. Eyes: Full and bright. Comb: Single, of medium size, erect, evenly serrated, and free from side sprigs. Face: Smooth. Ear-lobes: Of medium size and length. Wattles: Of medium length, rather oblong, and nicely rounded at the bottom.

Neck.—Of medium length, and abundantly covered with long hackle feathers, which should reach well on to the back.



Black Orpington Cock.

The head of this bird is held somewhat too forward for the typical stand of the breed.

Body.—Deep and broad; wide and slightly rising saddle, with full hackle which, with the long neck hackle, give the back a short* and somewhat concave appearance. Breast: Broad and well rounded (not flat), carried forward. Wings: Rather small, carried closely to the body, the ends almost hidden by the saddle hackle.

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* This term short, or fairly short, is often interpreted as no back at all. Fancy a deep and broad bird with practically no back! Evidently that is not intended, but only short as compared with a long-backed bird.

Tail.—Rather short, compact, flowing and inclined backwards, but by no means in "squirrel" fashion.

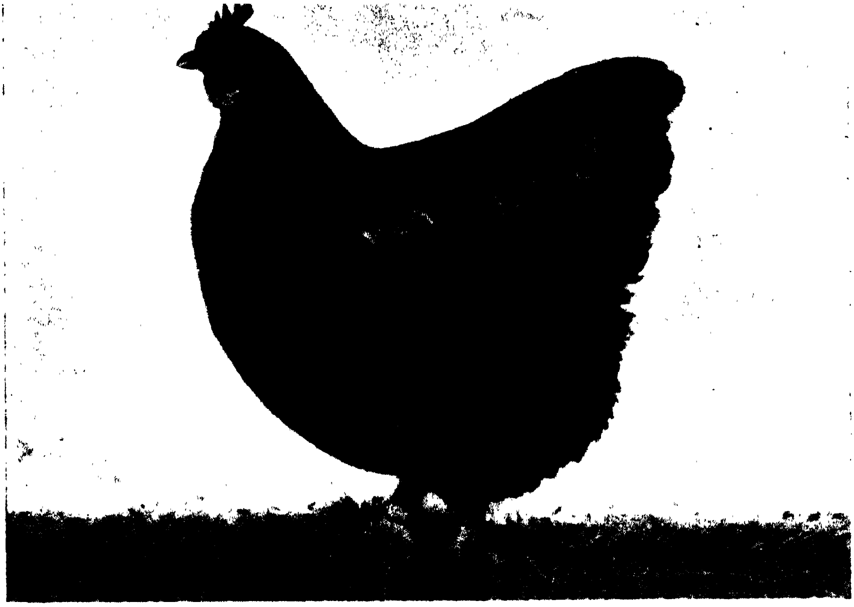
Legs and Feet.—Legs: Short and strong, the thighs almost hidden by the body feathering. Toes: Four on each foot, straight, and well spread.

Carriage.—Erect and graceful.

Weight, 10 lb.*

Plumage.—Fairly close, but not so hard as in the Game fowl, nor so soft, loose, and fluffy as in the Cochin.†

Handling.—Firm flesh.



Black Orpington Hen (a good dual-purpose type).

HEN.

The general characteristics of the hen are similar to those of the cock, allowing for the natural sexual differences. It is worth noting that the *cushion* should be small, sufficient to give the back a short and graceful appearance, but not full and round, or "ball" shaped, as in the Cochin.

Weight, 8 lb.*

COLOUR.

Beak.—Black. Eyes: Black, with dark-brown iris. Comb, face, wattles, and ear-lobes: Bright red. Legs and feet: Black; Toe-nails, soles of feet, and skin: White.

Plumage.—Black, with a green sheen.

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* See reference to weights in separate paragraph on page 216.

† Two extremes are mentioned; the margin appears too wide.

RHODE ISLAND RED (ABBREVIATED) FROM AMERICAN POULTRY CLUB STANDARDS.

Both rose and single comb are recognised varieties of this breed; all other points are the same.

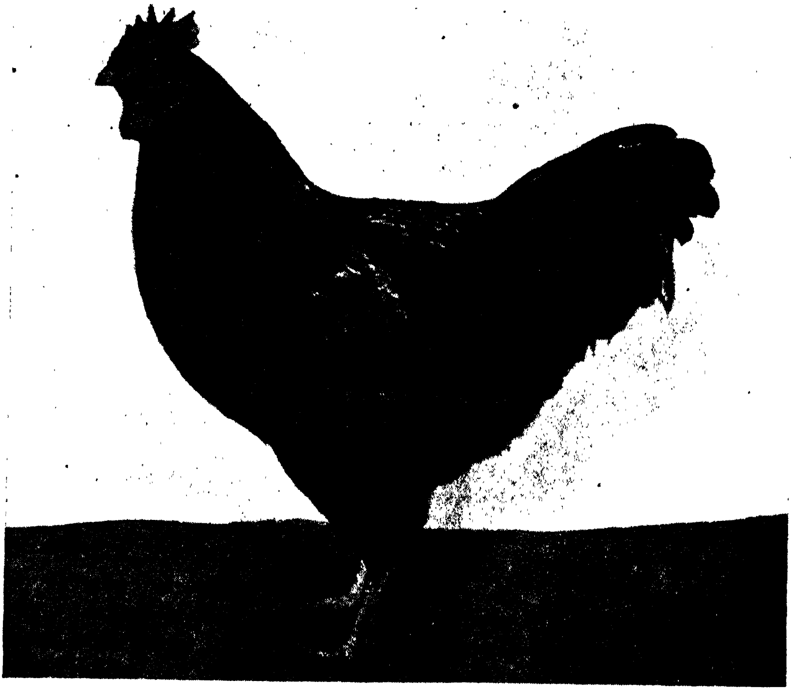
COCK.

Head.—Medium size; comb medium size, five serrations preferred; neck medium length with abundant hackle; body, broad, deep, and long, rising slightly above the horizontal to the neck.

Breast.—Deep and carried perpendicular nearly in line with the tip of the beak.*

Feather.—Moderately close.

Wings.—Large and full, but carried fairly close to the body.



Rhode Island Cock.

The head of this bird is held somewhat too forward for the typical stand of the breed.

Tail.—Medium length and carried well back; should not be whippy.

Legs.—Thighs large, medium in length, and well covered with soft feather.

Shanks.—Medium length, and rounded.

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* It should be noted when viewing the illustration that the head of the cock is not thrown back sufficiently to get the effect mentioned.

Colour of Cock.

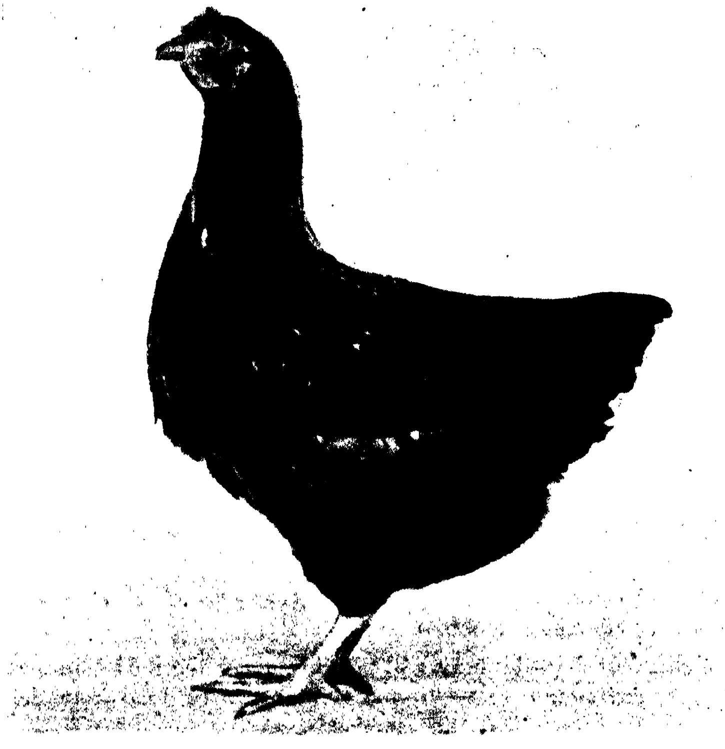
Beak.—Horn or yellow.

Eye.—Red.

Neck.—Harmonising with back and breast.

Wings.—Primaries, lower web black, upper web red. Secondaries the reverse. Flight coverets black, wing bows and wing coverets red.

Tail.—Main tail feathers and sickle feathers black or greenish-black. Tail coverets mainly black; but may become russet as they approach the saddle.



Rhode Island Hen (a good dual-purpose type).

Shanks and Toes.—Yellow or red horn colour.

Plumage.—General service rich brilliant red, except where black is specified. The under-colour and quill of the feather should be red or salmon.

FEMALE.

Head, comb, body, breast, feather, wings, and legs as in the points of male. Hackle more scanty than in the male and not coarse, and the tips of the lower hackle feathers should have black ticking, but not heavy lacing.

Tail.—Short and well spread. The colour of plumage, excepting where black is specified should be bright red and more even, but not as brilliant as in the male; under-colour should be rich. The body feathers in both sexes should be free from shaftiness.

Weights.—Cock, 8½ lb.; hen, 6½ lb.; cockerel, 7½ lb.; pullet, 5 lb.*

Standards of Weight.

In the matter of weights the standards are far from as explicit as they should be for the enlightenment of the novice in such matters. The English standard weights are stated for mature specimens; but a bird is regarded as mature at 12 months old, or even under; but the weight attained at that age by no means represents the average weight of mature birds, seeing that most specimens attain much greater weight in their second year. The weights set out in the English standards would more nearly apply to this age than to 12 months.

As far as Australian conditions are concerned, I consider the weights in the breeds under review in the English standards are somewhat excessive, and for the purpose of better defining this idea, I prefer weights as follows:—

ORPINGTONS.

Cock, 8 to 9 lb.; hen, 6 to 7 lb., at 12 months old. Cockerel, 7 to 8 lb.; pullets, 5 to 5½ lb., at 7 months old.

RHODE ISLAND REDS.

Cock, 8 to 9 lb.; hen, 6 to 7 lb., at 12 months old. Cockerel, 6½ to 7 lb.; pullets, 5 to 5½ lb., at 7 months old.

LEGHORNS.

Cock, 6 to 7 lb.; hen, 4½ to 5 lb., at 12 months old. Cockerel, 5 to 6 lb.; pullets, 4 to 4½ lb., at 7 months old.

As a rule pullets gain in weight, but this is very slow after they commence to lay and until they have moulted.

The weights stated in this way will possibly assist the novice in arriving at a better understanding of requirements than can be done from the way in which they are presented in the standards.

It should be understood that the illustrations and standards of excellence given here represent what should be the breeder's objective rather than what the writer expects to find plentiful in the yards of utility poultry-keepers.

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* See reference to weights in separate paragraph on this page.

Poultry Notes.

MARCH.

JAMES HADLINGTON, Poultry Expert.

UNDER poultry-farming conditions autumn hatching should be finished by the end of this month. As a matter of fact, the limited number of eggs obtained from birds that are fit to hatch from at this time of the year, together with the high price obtainable for eggs, will almost determine the policy of commercial poultry-farmers in this respect. But there are other reasons why a break should be made so that the autumn hatching does not link up with the main hatching season, viz., June to the end of September. To keep on hatching after March would mean that the rearing-ground would be continually occupied, and while this may be permissible where only small numbers of chickens are raised, it is fatal in the case of larger operations. Not only so, but chickens reared under poultry-farming conditions do not thrive nearly as well in winter as during the other months advocated. In addition, by ceasing to hatch now for at least a couple of months it enables the ground to become rested and comparatively clean, ready for the main crop of chickens in the spring. All lumber and impedimenta that obstruct the free circulation of air and sunlight should be removed as far as practicable, with the idea of exposing the ground as much as possible to those elements so that it may become sweetened.

Autumn Troubles.

The wet season recently experienced is almost certain to result in a more than ordinary crop of troubles among growing stock. Roup and chicken-pox in particular may be expected to be more than normally prevalent, therefore every precaution should be taken to guard against them. The prevention and treatment of chicken-pox have already been dealt with in the January notes. In regard to roup, it may not be possible to prevent it entirely, but much can be done in that direction by giving plenty of house room, and not unduly crowding young stock, which are more susceptible to it than adult birds. Many poultry-keepers, with the idea of preventing draughts, fail to admit sufficient ventilation to poultry-houses, and the birds are confined in an atmosphere favourable to the development of roup.

Roup.

This disease is the cause of more wastage in growing stock than all others put together. Late hatched chickens—that is to say, those hatched between the middle of October and the end of January—are particularly liable to fall victims to it in the autumn. It should be regarded as the archenemy of the poultry-keeper, and every possible precaution against it should be taken.

There is a wide-spread notion among poultry-keepers that, so long as everything is kept clean, fresh clean water regularly supplied, the poultry-house disinfected, and the chickens dosed with chemicals from time to time, immunity from disease is sufficiently ensured. But this is a fallacy that is calculated to keep poultry-keepers from a proper appreciation of the real cause. Cleanliness and sanitation, while commendable and of course quite necessary to the health of the birds, are not sufficient in themselves to keep away roup.

Good, airy, well-ventilated poultry-houses, and strong well-developed stock are the best safeguards against it. Where the opposite conditions prevail, and the growing stock is kept crowded into small ill-ventilated houses, no amount of cleanliness, disinfecting, or dosing with chemicals will ensure immunity from this disease.

Nor is it apparently necessary to introduce an obviously infected bird into the yards to start it. The contagious or infectious nature of the trouble is admitted, but it is more or less endemic in character, and only requires favourable conditions to start it. The autumn is a time when those conditions are most pronounced, and when outbreaks are consequently most numerous. Prevention is more to be relied upon than cure. Fresh air, sunlight, roomy quarters, and prevention of crowding are necessary if epidemics of roup are to be escaped.

Scientific research into the nature and cause of this disease among poultry has established the fact that it is not caused by any one specific microbe, but by a class of microbes; hence the difficulties in the way of preparing a serum with which to combat it, as is done in the case of diphtheria in human beings, although the two diseases are in many respects analogous, and, indeed, the disease of poultry is often called diphtheric roup. At any rate, no known success has been obtained by serum treatment so far, and roup still remains the most dreaded, because it is the most widespread, disease of poultry.

There are three recognised kinds of the disease known as roup. The first, and most difficult to cure, is that affecting the head, with a putrid discharge from the nostrils, commencing like a catarrh, and often spreading to the eye, which becomes swollen and filled with pus. Apparently the organisms penetrate the tissues, and make this form very difficult and often impossible to cure. The cases that do respond to treatment are mostly those of stronger birds that are lightly affected. No internal medicine seems to have much effect upon it, and the main thing is to support the strength of the bird with good feeding, and perhaps a tonic, such as Douglas' mixture.

The best method of treating this form of roup is to syringe out the nostrils and, if necessary, the eyes at least twice a day with equal parts of peroxide of hydrogen and water; but the following may also be used with some measure of success;—kerosene (undiluted), or a strong solution of permanganate of potash, or boracic acid and salt solution, using a teaspoonful of boracic acid and half a teaspoonful of common salt dissolved in half a pint of boiling water. If no other suitable syringe is handy, a common sewing-machine oil-can may be used for the purpose.

A good way to get the bird to clear its head and nostrils of the mucus is to submerge the head up to the eyes in a solution of permanganate of potash made about the colour of claret. The immersion should take place for a few seconds, the bird's head being held in such a position that it cannot breathe without taking in the solution; this will cause it to eject much of the objectionable matter. If this is done previous to the syringing, the latter will be much more effective.

The second kind is what is known as diphtheric roup, which is very like the true diphtheria in man. This may be recognised by a thick false membrane, somewhat of the character of mucus, filling the throat and mouth. This is most deadly if left to itself, as it will quickly choke the bird ; but it is, perhaps, the most easily treated. Flowers of sulphur lightly dusted into the mouth and throat twice daily for two or three days will usually clear it.

The third variety is known among poultrymen as canker ; this form is less prevalent, and, perhaps, less contagious than are the others ; but it attacks young and old alike. It has, however, a less debilitating effect upon the birds. In fact, they may have this disease and still appear in the best of health.

The symptoms of canker are a gasping or choking sensation, and the bird will sometimes cry out in its endeavour to get its breath. Upon examination they will be found to have a cheesy-looking substance growing round the windpipe, and sometimes in the mouth on the side of the throat or even on the tongue. In cases where it is round the windpipe it may grow to such an extent as to block up the air passage, causing asphyxiation. The remedy is to remove this substance with a piece of wire bent in the form of a small loop, taking care that the affected part is not made to bleed ; also, when round the windpipe, that no particle is allowed to fall into that aperture or the result will be fatal.

After the removal of the substance the affected part may be painted with a saturated solution of permanganate of potash or glycerine and iodine in the proportion of one part iodine to ten of glycerine. Another, but rather drastic, remedy is to apply very finely powdered bluestone and permanganate of potash in equal quantities, well mixed. In each case the remedy should be applied twice daily.

In regard to roup in general, the point to emphasise is that while many cases are of such a light nature that they will yield to treatment, the bulk of them will not be found to do so, especially the first-mentioned kind, when it once gets a footing among debilitated or weak stock. One has only to consider the amount of persistent effort and care necessary to pull a human subject through an attack of diphtheria to realise how utterly hopeless it is to attempt to cure a large number of birds suffering from this disease.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

At Mr. Fleming's orchard, Wagga-road, Mr. W. Brereton, Assistant Fruit Expert, gave demonstrations in thinning and pruning. The trees dealt with included cherries, nectarines, Cleopatra apple, Wiggins' peach, Napoleon pear, and Irish peach apple.

The Chairman, Mr. F. Wells, subsequently conveyed the thanks of the branch to Mr. Brereton, mentioning the assistance given by various experts of the Department to the producers of the district.

Bimbaya.

A meeting of this branch was held on 20th December, when papers were read by Mr. A. J. Alcock on the question, "Is it advisable to go in more for sheep in this district?" and by Mr. E. T. Boller on "The most profitable breed of cattle for the district."

From Mr. Alcock's paper the following paragraphs are taken :—

SHEEP IN THE BIMBAYA DISTRICT.

The position of the pastoral industry of Australasia a few years ago was comparatively easy and not at all uncomfortable. At that time there was little science required, and the type of sheep one was breeding mattered very little. But all that has changed, and to get the best results much serious thought and care are required. A pastoralist could breed sheep to suit his own fancy a few years ago, and make money at it. Now, his own fancy may mean ruination.

Certain breeds and types of sheep do well and give good results where other breeds would degenerate in both carcase and wool. To be successful in breeding sheep, the first thing is to study the climatic conditions and temperature in the particular district. By careful study, some districts have been found to be specially favourable to certain breeds. For instance : Place fine-woolled Merino sheep on the open western plains, and their fleeces will become lighter and lighter, until there is only a delicate fleece of small value, worth say about 2s. 6d., and weighing up to 4 lb., and a carcase that would not attract the attention of a butcher. Place a strong-woolled Merino, with a more robust nature, on these same unsheltered plains, and the difference will be very marked. The fleece will be healthy and uninjured by the heat and dust, and with careful management will weigh from 7 to 8 lb., with a good marketable animal at the same time. To go further into the great effect climatic conditions have on the breeding of sheep, we can consider the failure of the Spanish Merino sheep after they were introduced into England. They failed, while the long woolled and Down breeds prospered. The Angora goat, from which we get the celebrated mohair, is found in a state of perfection in Turkey in Asia, and in the Don district ; when moved into other climes the animals degenerate.

The enormous extent to which sheep are affected by climatic conditions being thus indicated, it is possible to understand more clearly what I have to say regarding sheep raising in our own district. I have heard that sheep were raised here on a large scale a number of years ago, but were slowly replaced by the dairying industry, which I can readily understand after having had several years' experience here with both sheep and cattle. Sound, healthy sheep, coming from good sheep country to this district, seem to go back altogether after the first twelve or eighteen months ; the wool loses the bright, lustrous silkiness of texture which goes to make it so valuable, and the carcase suffers in the same way. The climate on the coast is too moist, and the local pastures have an unfavourable influence upon the sheep, due no doubt to a lack of the lime, salt, &c., which are so necessary to build up bone and muscle, and to give strength and quality to the wool. It is hard to find even a very small paddock here without a swamp, in which sheep may gather fluke and stomach worms, which soon cause the health of the animal to fail completely.

With the exception of a few sheep (crossbreds preferred) kept for home mutton purposes, I feel quite convinced that it is not advisable to go in more for sheep in this district. The Romney Marsh or Kent sheep are best suited to any low-lying or swampy country, as they resist foot-rot and fluke to a greater extent than any other breeds, and under such conditions will prove a success when other breeds fail. The Romney Marsh crosses well with the Merino. For mutton the Shropshire-Merino cross takes a foremost place among crossbreds. For early maturity no class of sheep has excelled this breed; the mutton is of the highest quality, not too fat and with good square joints. This cross is well fitted to many pastures in the Eastern Division of this State. Under fair conditions the lambs can be got ready for market at six months old. In wool, the Shropshire-Merino is easily beaten by several other Longwool Merino crosses.

Mr. Boller's paper on the most profitable breed of cattle for the district produced an instructive discussion, and members recorded their thanks to both contributors.

Braidwood.

A branch of the Bureau has been formed at Braidwood, with over twenty members.

The first meeting was held on 22nd February, when Mr. J. W. Mathews, Sheep and Wool Expert, gave a demonstration at a local farm in the afternoon in the handling of sheep, and lectured in the evening.

Cattai.

A meeting of this branch was held on 10th January, at which fifteen members were present. A discussion took place on the handling of fruit and the representation of the branch at the forthcoming local show. The Rev. J. Marshall read a paper on maize-growing.

Comboyne.

Mr. G. C. Sparks, Inspector of Agriculture, visited this branch and delivered a lecture on wheat fodder and silage, on 18th January. Practically all the members of the branch were present. The historical aspect of the subject of ensilage was briefly referred to, and full information given regarding ensilage-making and the construction of silos. The lecturer also exhaustively dealt with haymaking, and the cultivation and characteristics of the various green fodder crops, and referred especially to the results obtained on the Farmers' Experiment Plots. At the conclusion of the lecture a number of questions were asked, principally on the subject of liming and the use of artificial manures.

Cordeaux-Goondarin.

A meeting of this branch was held on 6th December, when a paper was read by Mr. G. H. Walker, of which the following is a condensation :—

THE DISPOSAL OF THE FRUIT CROP.

Having arrived at the time when the results of months of work must be harvested, the preparation of fruit for market is the first and great factor. Should the packing and grading be faulty the excellence of the crop is lost, and a lower price than it is really worth is returned to the grower. As fairly representative of the whole district, we should take the standard of size and quality set up by the Agricultural Department, which has been well received on the Sydney market.

The question of wrapping will have to be settled individually. Wrapped apples have always a better appearance on the market stall, and are becoming more common than heretofore. The best apples should always be wrapped; the roughness of our roads makes this a necessity. Uniformity is also vital to good packing.

The sale of the fruit is the one great question that will exercise the mind of every grower, be his crop large or small. Every man has his favourite agent or method of disposing of his harvest, but we know that in the past the growers have always received too small a proportion of the total amount. It is a serious question and should be looked at very closely, for the fact that the man who gives twelve months' work to the production of the fruit gets less than the one who handles it probably for less than a week is an anomaly.

We know of the manipulation of the market, of the repacking, of agents selling to one another to the detriment of the grower, and of the apparent failure of several efforts at co-operative marketing, and have to recognise that the problem is a difficult one.

A method has been very successfully put into practice by Queensland growers. During the past two years they have had a representative who has a depôt to which the total crop is consigned. He acts on behalf of the growers as a distributor. Knowing the state of the market, he holds back in case of a glut, storing in cool chambers if necessary, and selling if prices are good. So successful have these operations been that Tasmania has followed the lead.

In grading our crops we have always a surplus of from 15 to 20 per cent. of unmarketable fruit, and the question of the disposal of this at a profit is worth considering. It can be dealt with by drying, or pulping, or making cider, perry, and vinegar, and so on.

In the drying of apples, nearly all varieties dry well, the exceptions being the very juicy ones. All the cooking sorts, with firm, white flesh, make the best dried product, and there is always a full demand for this article. A small plant would be necessary, consisting of an apple-peeler and corer, fumigating chamber, and evaporating room, where the fruit may be kept at 140° to 160° Fahr., until dry.

No fruit need be wasted; that not suitable for drying may be pulped and put into petrol tins, holding about 50 lb. each. These are eagerly bought by hotels, restaurants, and boarding-houses. Cider may be expressed from windfalls, and the rough juice will be purchased by vintners. Vinegar that is better than malt vinegar can be made from apples, and is largely used in America.

On 11th January, Mr. Le Gay Brereton, Assistant Fruit Expert, gave demonstrations of summer thinning and also of fruit packing at Mr. G. H. Walker's orchard at Kembla Vale, and at Mr. R. J. Fishlock's orchard, Cordeaux River. At night Mr. Brereton gave a lantern lecture, which was attended by thirty of the members and their friends.

French's Forest.

A branch of the Bureau has been formed at French's Forest, twenty-one members being so far enrolled. A meeting was held on 10th February, and the following officers were elected:—Chairman, Mr. T. D. Mitchell; Vice-Chairman, Mr. Barnes; Treasurer, Mr. E. Moberley; Hon. Secretary, Mr. J. W. West.

The branch is to meet every four weeks, and the Hon. Secretary reports that much interest is taken locally in the work of the organisation.

Glenorie.

A meeting of members was held on 13th January, when there was a large number present. There was a long discussion on the question of the disposal of the fruit crop, Mr. F. A. Nicolson giving an account of the co-operative method of handling fruit in California.

Several other questions of interest to fruit-growers were subsequently discussed, such as railway communication, fruit preserving, and the use of various fertilisers.

Holbrook.

The annual meeting and the election of office-bearers was held on 10th February.

General satisfaction was expressed at the work done by this branch during the first year of its existence, particularly the valuable information gained from the demonstrations and lectures given by the Department's experts.

Members expressed regret that Mr. F. J. Gifford was unable to act as Secretary to the branch for the future.

The balance-sheet showed that receipts from members' fees amounted to £4 15s., and the expenditure to £4 12s.

The indications point to a very keen interest being displayed in the work of the branch.

Kellyville.

A meeting was held on 3rd February, at which there was a good attendance of members. Amongst matters dealt with were the arrangements for a lecture entitled "Manuring of Orchards," and the offer of the Public Library to supply books on agricultural subjects for distribution amongst the members of the branch.

A letter was read from the Secretary of the Castle Hill show, offering space for an exhibit from the branch. It was decided that the exhibit should be staged, and arrangements were made for carrying out the necessary work, in order that the branch might be fully and properly represented.

Lidcombe.

A meeting was held on 15th January, when Mr. H. J. Rumsey, of Dundas, gave an address on cultivation of cabbages and cauliflowers. There were fifty-one members and visitors present, and eight new members were admitted. The Secretary reports that the branch is rapidly gaining prominence in the district, and there is evidence of keen interest among the members. Arrangements have been made for a visit to Dundas at an early date, when Mr. Rumsey is to give a demonstration of an overhead system of irrigation.

Meadow Flat.

A meeting was held on 3rd February in order to elect a new Secretary. Mr. Barkell was elected to the position, and some twenty new members handed in their names.

Middle Dural.

A meeting was held on 5th instant at which a discussion took place on the general facilities afforded to fruit-growers.

Nimbin.

The annual meeting was held on 6th January, when the officers for the ensuing year were elected, and a programme was arranged.

Toronto.

The annual meeting was held on 30th December. The officers were elected for the ensuing year, and a full programme of lectures and papers arranged. Attention was drawn during the evening to the way in which Toronto is going ahead as a fruit and vegetable growing centre.

Yarramalong.

A meeting was held on 20th January, at which twenty members were present. It was decided that in future the branch would hold meetings in various parts of the district, in order that its work might be brought before as many as possible. It is hoped that this will increase the membership and create a wider interest.

A programme committee was also elected for the year.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	A. J. Alcock, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Boolaroo	J. Raw, Fairfax-st., Spier's Point.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Core, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	J. Clatworthy, Millpose, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondaria.	F. A. March, Cordeaux River, Mt. Kembla.
Coreen-Burraja	———
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
French's Forest	J. W. West, French's Forest.
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Hesdon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne	Sylvester Kennedy, Jindabyne.
Katoomba	W. E. Parry, Victoria Road, Katoomba.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Lankey's Creek (Jingellic).	G. J. Nichols, P.O., Jingellic.
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A. E. J. Anderson, B.A., Platform-street, Lidcombe.

Branch.	Hon. Sec.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	—Barkell, Meadow Flat, via Rydal.
Middle Dural	A. F. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	H. R. Parkes, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Rawsonville	———
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	D. J. Dougherty, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, Wyalong W.
Spencer	P. A. Edwards, Public School, Spencer.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Thyra-Bunaloo	C. H. M. Smith (*pro tem*), Thyra, via Moama.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Wetherill Park	L. Rainbow, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	A. Cavill, Campbell-st., Woonona.
Wyan	———
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yass	———
Yetholme	N. D. Graham, "Bona Dea," Yetholme.
Yurrunga and Avoca.	R. Waples, Yurrunga.

Orchard Notes.

MARCH.

W. J. ALLEN.

Preparation of Land for Planting.

THOSE who have fresh blocks grubbed and cleared for planting could, to advantage, have them ploughed and subsoiled this month. By so doing not only does the land have a chance to sweeten, but it will also conserve the moisture of any showers that may fall between now and the winter planting season. It also enables one to complete his planting operations without delay when the time comes for this work. If trees have not been ordered for either new orchards or re-fills no time should be lost in placing same. Orders are generally dealt with as received by the nurserymen, consequently the earliest orders get the first pick of the trees.

Planting Citrus Trees.

Where land has been well prepared and is in moist condition, citrus trees can be planted this month. It is a good plan to wrap the stems of newly planted citrus with hessian or light sacking to protect them from the sun until they make some foliage. As a general rule autumn planting is "safe," but should a dry spell occur soon after planting, and the ground become dried out, the young trees should each be given a couple of buckets of water to keep them going until their roots are established.

Cultivation.

Where weeds have made any headway it is a good plan to get them turned under during the latter part of this month, then, if no cover crops are to be planted, the land will require very little or no attention until the ploughing for next season commences.

Cover Crops.

In cases where cover crops are to be sown the ground should be ploughed and the seed sown as soon as possible, the object of this being to get as much growth as possible before it is time to plough them under late in the winter. From 50 lb. to 80 lb. fertiliser per acre sown with the crop will also tend to hasten its growth.

Harvesting.

Fruit is ripening late this season, and those who intend drying will have to be careful or they may pick their raisins, sultanas, and prunes too green for drying purposes.

Grading.

As exports will be very limited this season our local markets are likely to be over supplied with apples, the result being that only the best grades will be saleable at profitable prices. Hence, in grading for market, the standards will have to be high, consequently the percentage of rejects from the "packs" will be greater than usual. These rejects might be turned to account by either drying or pulping. Articles on "Drying" were published in the last two issues of the *Gazette*, and the Departmental Bulletin No. 88 deals with pulping, preserving, jam making, &c.

Packing.

The highest grades of apples will open up stalk-marked or punctured when packed unwrapped. This, perhaps, will not interfere with the sale of the fruit locally, but buyers would hesitate to purchase it for re-consigning to country districts. Generally, fruit packed in this way is unsaleable if the market is not firm on its arrival, but the same grade of fruit properly wrapped commends itself to buyers for country trade.

Fruit Cases.

The high prices of cases has increased the practice of using second-hand and "returned" cases. Growers should be careful when using either of these that they are not introducing pests or diseases to their orchards. Dipping cases, which have been previously used, in boiling water before they enter the orchard is a safeguard against this danger.

Fruit Pests and Diseases.

Growers should on no account fail to boil or burn all waste fruit, although there seems a tendency to neglect this precaution towards the end of the fruit season, which only increases the danger of infection the following spring.

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

BULLS FOR SALE

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Faithful Fido (49): born 5th May, 1915; colour, fawn and white; sire, Hayes' Fido (imp.); dam, Faith (48 A.G.H.B.), by Prince Souvia, from Miss Clatford of Wollongbar (imp.); by Clatford Hope II (1814 E.G.H.B.); from Clatford Hopeful (imp.). Price, **50 guineas.**

Milk record of dam for 7 months—3,894 lb. milk and 246·33 lb. butter.

This record was made during the dry spell, and the cow had only two teats yielding milk.

General Sairrail (58): born 4th December, 1915; colour, fawn and white; sire, George III (15 A.G.H.B.); dam, Psyche (157 A.G.H.B.), by Calm Prince (2), from Bel Air VI (imp.) (5802 P.S.R.G.A.S.) Price, **40 guineas.**

Milk yield of dam, 3-year old—4,448 lb. milk and 255·97 lb. butter in 243 days.

AT GRAFTON EXPERIMENT FARM.

AYRSHIRE.—Jamie of Grafton: born 25th December, 1915; colour, red and white; sire, Isabel's Majestic (861 A.A.H.B.); dam, Jamie's Rose (Vol. X, A.A.H.B.); by Jamie's Heir, from Auchen Rose; by Daniel of Auchenbrain (imp.), from Primrose II; by General, from Miss Prim; by Mischief Maker of Barcheskie (imp.), from Primrose of Barcheskie (imp.). Price, **20 guineas.**

AT GLEN INNES EXPERIMENT FARM.

AYRSHIRE.—Bruce: born 27th March, 1916; colour, dark red, little white; sire, Wyllieland Bright Lad (imp.); dam, Mystery, by Jamie's Heir, from Juliette; by Mischief-maker of Barcheskie (imp.), from Judy IX of Barcheskie (imp.). Price, **10 guineas.**

Milk yield of dam—5,007 lb. milk and 251·70 lb. butter in 273 days.

GEORGE VALDER,
Under Secretary and Director of Agriculture.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Bangalow A. and I. Society	W. H. Reading	Mar. 6, 7
Yanco Irrigation Area A. Society	F. D. Inman	,, 6, 7
Mudgee A., P., H., and I. Association	P. J. Griffin	,, 6, 7, 8
Tenterfield P., A., and M. Society	R. G. White	,, 6, 7, 8
Braidwood P., A., and H. Association	L. Chapman	,, 7, 8
Coramba District P., A., and H. Association	H. E. Hindmarsh	,, 7, 8
Tumut A. and P. Association	T. E. Wilkinson	,, 7, 8
Manning River A. and H. Association (Taree)	L. Plummer	,, 8, 9

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1917.

Society.	Secretary.	Date.
Crookwell A., P., and H. Society	M. P. Levy	Mar. 8, 9
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne	,, 8, 9, 10
Nepean District A., H., and I. Society (Penrith)	P. Smith	,, 9, 10
Queanbeyan P. and A. Association	J. G. Harris	,, 13, 14
Glen Innes & Central New England P. & A. Assoc'n	G. A. Priest	,, 13, 14, 15
Cobargo A., P., and H. Society	T. Kennelly	,, 14, 15
Gundagai P. and A. Society	A. Elworthy	,, 14, 15
Nambucca A. and H. Association (Macksville)	M. Wallace	,, 14, 15
Nimmitabel A. and P. Association	O. E. Silk	,, 20, 21
Quirindi District P., A., and H. Association	A. N. Pountney	,, 20, 21, 22
Armidale P., A., and H. Association	A. McArthur	,, 20,21,22,23
Molong P. and A. Association	W. J. Windred	Abandoned.
Delegate P. and A. Association	F. Mullaney	,, 21
Moruya A. and P. Society	H. P. Jeffery	,, 21, 22
Gloucester A., H., and P. Association	G. E. Furness	,, 21, 22
Camden A., H., and I. Society	A. E. Baldock	,, 21, 22, 23
Batlow A. Society	C. S. Gregory	,, 27, 28
Blayney A. and P. Association	E. F. Simmons	,, 27, 28
Tamworth P. and A. Association	J. R. Wood	,, 27, 28, 29
Walcha P. and A. Association	J. N. Campbell	,, 28, 29
Cooma P. and A. Association	C. J. Walmsley	,, 28, 29
Macleay A., H., and I. Association (Kempsey)	E. Weeks	,, 28, 29, 30
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 28, 29, 30
Royal Agricultural Society of N.S.W.	H. M. Somer	April 3-11
Clarence P. and A. Society (Grafton)	G. N. Small	,, 18, 19, 20
Orange A. and P. Association	W. J. I. Nancarrow	,, 18, 19, 20
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 18-21
Wellington P., A., and H. Society	A. E. Rotton	,, 24, 25
Upper Manning A. and H. Association (Wingham)	D. Stewart	,, 25, 26
Lower Clarence A. Society (Maclean)	K. McKay	,, 25, 26
Dungog A. and H. Association	C. G. Grant	May 2, 3
Coonamble P. and A. Association	J. C. Wilson	,, 2, 3
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 3, 4, 5
Kyogle P., A., and H. Society	D. Campbell	,, 9, 10
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 21, 22, 23
Parkes P., A., and H. Association	G. N. Seaborn	,, 22, 23
Forbes P., A., and H. Association	J. H. Bates	Sept. 4, 5
Albury and Border P. A. and H. Society	W. J. Johnson	,, 4, 5, 6
Manildra P. and A. Association	A. Anderson	,, 5
Ganmain A. and P. Association	T. S. Henderson	,, 11, 12
Lockhart A. and P. Society	E. D. Arnold	,, 12, 13
Cowra P., A., and H. Association	E. W. Warren	,, 18, 19
Narandera P. and A. Association	H. S. Robinson	,, 18, 19
Yass P. and A. Association	E. A. Hickey	,, 26, 27
Junee P. A. and I. Association	T. C. Humphreys	Oct. 2, 3
Ardlethan P. and A. Society	W. J. Nixon	,, 3
Hay P. and A. Association	G. S. Camden	,, 10

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VOL. XXVIII. PART 4. APRIL 2, 1917.

Agricultural Gazette of New South Wales.

The Care of Seed Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

MANY farmers realise the advantage of having acclimatised seed maize which has become adapted to their particular conditions of soil and climate, but owing to the ravages of weevil and grain moth there have been so many disappointments in keeping seed, especially on the North Coast, that the practice of keeping one's own seed has been given up in despair by many, with the result that much valuable seed is lost, and yields are lessened in consequence.

It sometimes happens that a farmer sets out to test a new variety or a new strain, but an unfavourable season or unacclimatised seed is responsible for a poor yield, and a little of the seed is kept, with a view to further trial next year. Notwithstanding that the seed is put in a tin, it is by no means uncommon for the seed to prove useless when sowing time comes. "The weevils got in somehow," says the disgusted farmer, and a grower who, with better fortune, might have become an enthusiast in maize improvement, declines to attempt to keep good seed again.

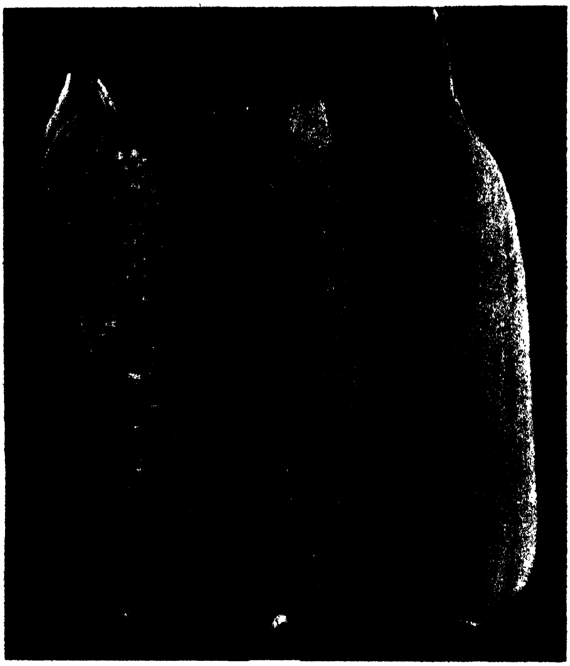
Some of the methods of keeping seed maize which have been successfully used at Grafton Experiment Farm and at other places, where it is often necessary to keep seed for two seasons, and sometimes for even longer, will therefore, no doubt, be welcomed by those who have had trouble in keeping seed over from harvesting to planting time.

Properly-kept seed maize has a high germinating capacity—a factor that has a very large influence in securing good yields.

A Special Seed Plot is Desirable.

Apart from other considerations, there are at least two main arguments in favour of establishing a special seed plot for maize. Firstly, it is well known that maize is a cross-fertilised plant, each plant depending on its neighbours for pollination and fertilisation. Remembering this, it is evident that in a special seed plot sown with the best selected seed, the chance of a plant being cross-fertilised by an inferior plant is less remote than in a large field area. It is possible by this means more quickly to eliminate from the variety any undesirable characters which have an effect on the keeping of seed, as, for instance, lateness and lack of uniformity in maturing and insufficient husk protection, which allows weevils to enter. The seed selected from this plot can be harvested separately and kept apart from any other, and if this practice is continued from year to year it must make for steady and permanent improvement in both yield and quality of seed.

Secondly, a special seed plot can be made the object of special attention. An acre or half-acre plot in a handy position can be cultivated or attended to at any odd hour, while it may be quite impossible to cultivate a larger area owing to lack of time. The boy on the farm can develop an interest in the selection of seed maize, and will take a special interest in a small plot on which he can do most of the work himself.



Types of Ears, showing—1, husk open and much of the ear exposed to insect and fungus attack. 2, tip exposed. 3, a well-covered ear.

Time of Planting.

It is well known to most North Coast farmers that early-sown maize crops are more infested with weevil in the field than late plantings, and that the seed from the early crops is consequently more difficult to keep. It has been pointed out in previous articles that the later-sown crops on the North Coast usually get more rainfall than the early plantings, and it is worthy of note that although early sowings have often failed as the result of dry spring seasons, failures of late plantings never occur in that district. At Grafton Experiment Farm the special seed plots are never sown earlier than November or December, and during last season a January sowing of Improved Yellow Dent—a late variety—turned out an excellent sample of seed, almost entirely free from weevil and grain moth. The only attention required in this instance was to see that the seed ears, which still contained a fair amount of moisture when harvested, were well aerated in drying. The latest date at which planting can be safely made is therefore recommended for the seed plot. This depends, of course, on local conditions, and particularly on the experience with early autumn frosts.

Selection in the Field—an Important Consideration.

It may be wondered by some what connection has selection in the field with keeping seed maize free from weevil; but anyone who practises field selection knows that the reason is not far to seek. It is easily one of the most important considerations on the warm North Coast, where the weevil and grain moth infest the ears in the field before harvest. Any farmer who has practised field selection in this district will have observed that weevils are entirely absent from those ears that are covered fully and tightly by the protecting husk, whereas those ears which the husk does not completely cover, or on which the husk is scanty and loose, are an easy prey—indeed, an invitation—to the weevils that fly about in the field seeking the grain on which to lay their eggs. The depositing of the eggs occurs while the grain has yet considerable moisture, so that by the time the ears are hard and fit to pull it is no uncommon thing to find the grain riddled with weevil. Some varieties of maize have much better husk protection than others, and although it means a good deal on the North Coast to start with a variety that has this desirable characteristic, it must not be forgotten that any variety can be greatly improved in this direction by field selection.

Sack Pickers at work in the field, in the United States of America.

When and How to Harvest Seed Ears.

It is advisable in those districts where early frosts are anticipated to harvest the seed ears early. A slight frost of 2 or 3 degrees does not usually injure the germ of maize, but a heavier frost will kill the germ entirely if there is still considerable moisture in the grain. The writer has harvested ears in the milk stage, stored them carefully, and obtained 95 per cent. germination from the seed; but owing to the shrivelled appearance of such seed when dry, it is not advisable to resort to harvesting so early as that unless there is danger of the ears being frosted in the field. It is possible to guard against injury from frost better in the storeroom than in the field. More care is necessary in storing seed maize harvested on the "green" side. It is essential to dry it quickly, for there is more chance of it moulding in storage, owing to its high moisture content. The best stage to harvest early is at the hard dough stage, *i.e.*, when the husk is quite yellow; but even then care must be taken in drying, as the grain may still contain 30 per cent. of moisture.

The work of selecting good seed ears in a large field of maize may be carried out when the field is being harvested by attaching a box to the end of the harvesting dray to hold the selected ears. By far the better plan, however, and the one which is most suitable for harvesting a special seed plot is to sling a canvas bag round the shoulders, and thus to have both hands free for examining the ears on the stalk.

Not only because it is essential to examine the type of ear before selection, but also because it is better for storing the seed, it is advisable to husk the ears in the field. It is thought by some that seed ears will keep better in the husk than with the husk removed. This may be partly true when storing in bulk, especially if most of the ears are well covered with husk. Where this is not the case, the operation of husking removes a large number of weevils which the husk would otherwise shelter. In districts that do not have a dry winter there is greater likelihood of immature or not properly dry maize heating in bulk storage in the husk. For a smaller quantity of seed ears, it is better in all districts to husk in the field and store the husked ears.

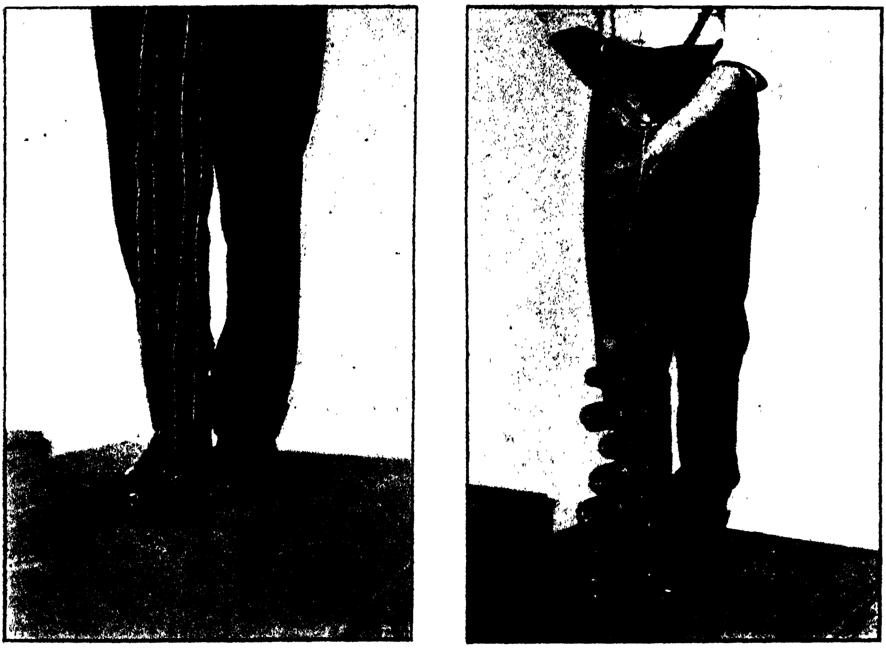
It is advisable to harvest about two or three times as many ears as will be required, and to make a final selection in the barn or storeroom, where the type of ears can receive more attention.

Curing or Drying Seed Ears.

This is a very important part of the process of keeping seed maize, as the germination capacity depends on it to a very large extent. Seed that has been well harvested and well cured should give 98 per cent. germination the following spring, and should keep for at least three years, giving 90 per cent. germination the second year and 80 per cent. the third year. Under various conditions, the writer has obtained this average with seed maize kept in the manner outlined in this paper.

As late plantings have been suggested for the special seed plot in order to lessen the chances of attack by weevil, more care will usually be required in curing than would be the case with early sowings.

Drying "green" ears or moist grain in the sun for any length of time is a practice than cannot be recommended, as it has been found to injure the vitality. It is also important that the seed should not be exposed to the weather if good germination results are desired. Good ventilation in a storeroom is the first essential, and if this detail is attended to there will usually be no trouble about bringing the moisture-content down to about 10 or 12 per cent. in eight to ten weeks, when it is safe to store in a seed-bin or air-tight receptacle. During cold, wet winters drying may be assisted by storing in a room which is provided with a stove where a fire may be lit on unfavourable days. A kitchen or attic is a very desirable place for curing seed where the winter conditions are unfavourable. It is best to get the maize dried as quickly as possible. Kiln-dried seed maize has not only been found to give a higher germination, but also a higher yield than seed dried by any other means.

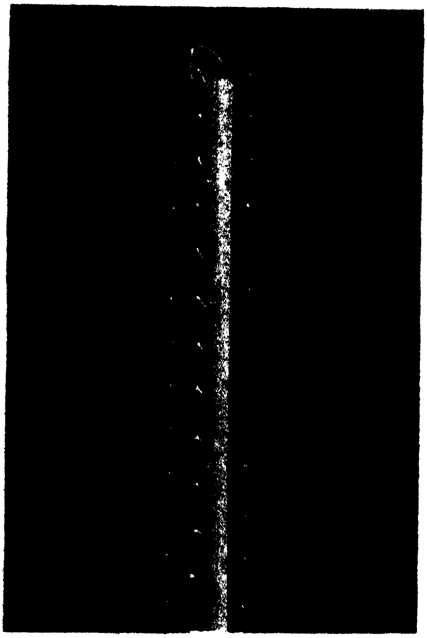


The "Double-string Method" of Fastening Seed Ears for Storage.

Where any artificial heat is resorted to, it is highly important that there should be good ventilation, especially during the first few days, when the bulk of the moisture is being driven out of the grain. A few warm, drying days should be awaited before finally storing the seed away in bins, for if it is put away during damp weather the seed will have absorbed additional moisture from the atmosphere, and the moisture-content will again exceed the safety mark for storage without ventilation.

In districts where weevil and grain moth are not troublesome, and where the seed can be otherwise kept away from mice and rats, or where it is intended to plant in early spring, before the insect pests make any headway, it is possible to dispense with storage bins, but under most circumstances it will be found advisable to store away after curing, and to adopt some preventive measures or remedies for weevil and grain moth.

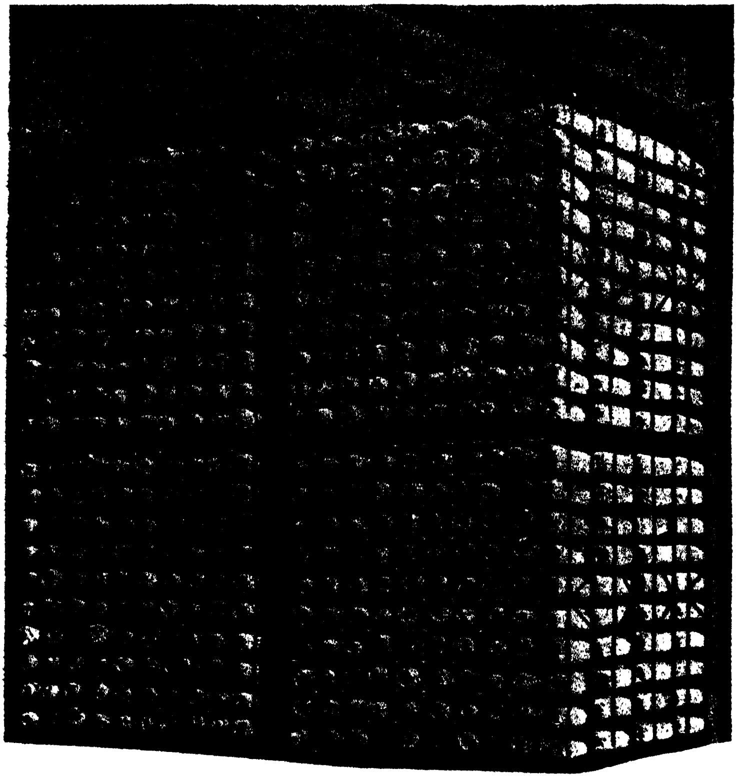
A simple method of fastening seed ears so that they can be hung up for curing is that known as the "double-string method." In this the end of a double piece of string is held in each hand by one man, with the middle touching the floor. After the first ear is placed on the string by another operator, successive ears are firmly piled above it in the loops made by the first man passing one hand alternately backwards and forwards through the loop held in the other hand. In this way the ears are firmly held by the string, and are yet kept apart; and when the string is full the "bunch" may be tied at the top and hung up.



A "Corn Tree."

Another device for holding seed ears is known as a "corn tree." It consists of a small pole studded with nails driven in a slanting position, about 3 inches apart. On to these the cobs are pushed at the butt-end. The method ensures good ventilation round each ear, keeps them from touching, and enables them to dry quickly. Being portable, the "tree" can be placed near a door or window, or in a passage where there is a good draught of air.

Wire or batten racks can also be made cheaply in the form of pigeon-holes or separate compartments for holding the ears separately, and they can be made to hold a considerable number of seed ears in a comparatively small space.

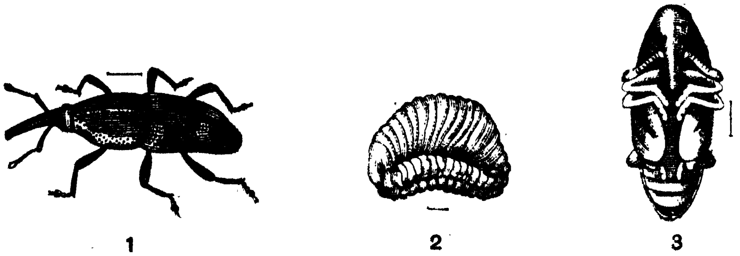


Wire Racks as used for drying corn in the United States.

The Weevil.

Before any measure of success can be obtained in the treatment of any pest, it is necessary to know at least something of its life history. The weevil that causes most of the damage to maize and other grain in this country is the rice weevil (*Calandra oryza*, L.). This species differs from the grain weevil (*C. granaria*, L.), which is not known to occur in Australia, in possessing functional wings, which it uses in flying from the barn to the field, and there commencing its infestation of the new season's maize. Either the egg, grub, or the pupa survives the winter if not too severe (which is never the case on the North Coast), and quickly reaching the adult stage at the first signs of spring, the female weevils fly to the field and lay their eggs on the exposed ears that are not properly covered by the husk. This may occur even as early as the hard dough stage of the grain. By the time the grain is mature the weevil has passed through another generation, and the second brood has already emerged or may be seen emerging from the riddled grain, or the characteristic white tunnelling made by the grub can be seen on the grain, indicating that the second brood is inside the grain in either the grub or the pupal stage.

A small puncture is made in the grain by the weevil with its sharp snout or proboscis, and the egg is laid in this puncture. If the husk is tight and completely covers the ear, it will remain untouched; but if the tip is exposed the ear becomes infested. Those ears are the most badly affected where the husk covering is loose as well as incomplete, thus enabling the weevils to get over the entire ear. With suitable temperature the eggs hatch in about three days, and the minute grub eats its way round near the surface of the grain for a little distance, leaving a characteristic white mark, which can be easily traced until the grub works too deeply into the grain. The young grub has hard, chitinous mouth parts, which are brownish-black in colour, and which it uses for eating its way into the grain. The rest of the body of the grub is very soft, creamy white in colour, and very thick, with the under surface straight and the back very much raised and curved into an almost semi-circular form.

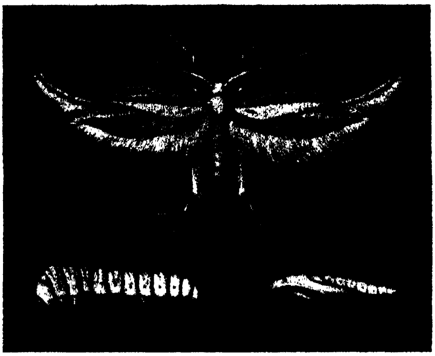


The Rice Weevil (*Calandra oryza*, **L.**), **which infests maize.**
1.—The adult weevil. 2.—Larva. 3.—Pupa.
(*After Chittenden, Div. Ent., U.S. Dept. Agr.*)

The grub eats its way inside the grain and grows in size until it becomes elongated in form, when it pupates or passes through a resting stage, surrounded by a pupal skin. In this stage, as well as in the egg, it is somewhat resistant to injury from fumigants and cold weather. The larval or grub stage lasts for two or three weeks, and during this time in most cases the germ is uninjured. The length of the pupal stage depends on the prevailing weather conditions; under favourable conditions (*i.e.*, warmth and moisture) it may last only three or four days; but if the weather continues to be cold, development is retarded, and the pupa remains dormant. Extremely cold weather may, however, kill even eggs and pupæ. Some time ago it was averred that maize grown at Tumut was resistant to weevil, but on investigation it was proved that when this maize was taken to the North Coast weevils were bred in it after exposure just as quickly as in any other maize. The fact of the matter is that the climate on the Southern Tableland is wholly unfavourable to the growth and development of the weevil, on account of the long period of low winter and spring temperatures; the summer weather is quite favourable, however.

The pupa is quite white or creamy white in colour, but before shedding the pupal skin a considerable brown or reddish-brown colouration appears. When the pupal skin is shed and the adult emerges, it remains inside the grain for three or four days actively feeding. It is usually during this stage that the germ is injured. The adult weevil meantime hardens, and becomes darker in colour, until when it eats its way out of the grain it is almost black. The whole time occupied under favourable conditions from egg to adult is about five to six weeks, so that with early-sown maize on the North Coast (harvested in January or February) there may be four or five broods before the advent of sufficiently cold weather to retard development. As most of the real damage is done before the winter, it is easy to see why seed from early-sown maize is harder to keep.

Many of the weevils appear to meet their fate in trying to emerge from the grain, becoming caught fast after getting their head and forelegs free. There is an old saying amongst farmers that "weevils come out of corn, but do not go into it." How far this is true will be seen from the foregoing life history. At the same time weevils are sometimes seen going into riddled grain for a temporary refuge during cold weather.



The Grain Moth (*Sitrotoga cerealella*, Oliv.), showing the moth, larva and pupa.
(From U.S. Dept. Agr., Bur. Ent. Circ. 118.)

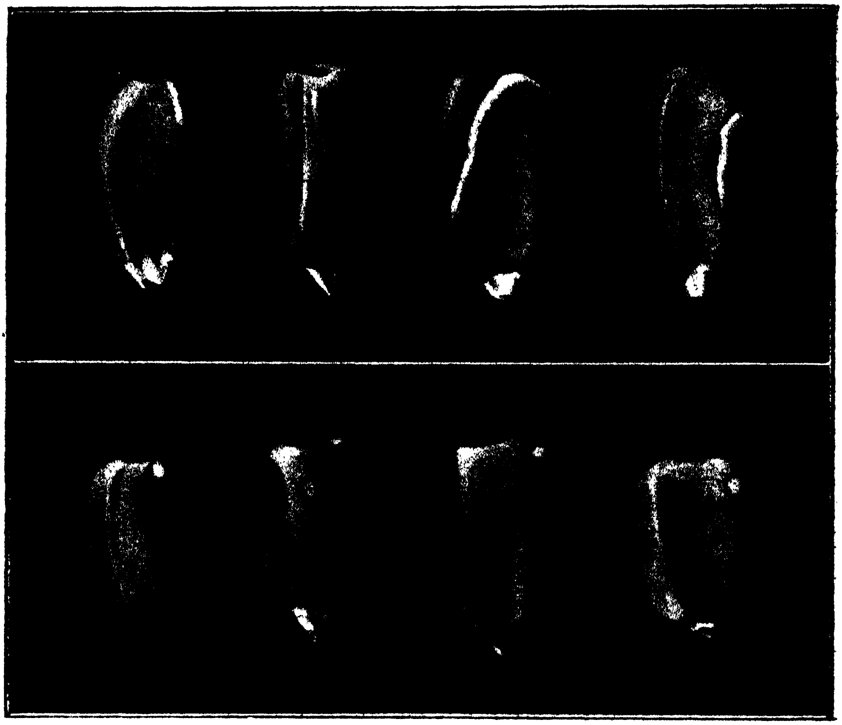
As soon as warm weather comes after winter, the development of the weevils proceeds, activity beginning at the various stages at which it was suspended by the advent of the winter. The longer maize is kept in the spring without treatment the more weevily it is likely to become, and if the seed is to be kept for a late sowing it should be examined at least every three weeks and treated if necessary.

The Grain Moth.

There is a widespread opinion amongst farmers that the grain moth is a stage of the weevil just described, but a knowledge of the life history, apart from any knowledge of systematic entomology, at once dispels the idea of any connection between the two.

The grain moth (*Sitotroga cerealella*, Oliv.), though not long introduced into this State, is fairly well established in both the maize and the wheat districts.

The first brood starts with the eggs laid on the kernels while the ears are still immature in the field, and according to the writer's observation the tips at least of all ears suffer alike, whether they are well covered with husk or not. This fact would lead one to suppose that either the adult moth works its way down through the dried silk to lay its eggs on the kernels, or the young grubs, after being hatched from eggs near the top, are able to make the migration themselves. It is probably the latter explanation which is the more correct. This has never been observed to be the case with the weevil, for in their case the exposure of the ear is essential to the deposition of eggs. However, it has been observed that where the husk fits tightly over the ear only the tip grains are affected by either moth or weevil by the time the maize is harvested. Obviously then, if at harvest time the tip grains were removed from all seed ears, much injury that is done to the rest of the cob by later broods emerging from the infected grains would be prevented.



Evidences of Insect Attack.

Top grains showing the characteristic white mark made by the Weevil.

Bottom grains attacked by the Grain Moth, showing the circular patch of skin or hull on the outside of the grain, which can be easily pushed aside by the mature moth when ready to emerge.

In most cases the young larva or caterpillar of the moth, on hatching from the egg, which takes place in a week or so under favourable conditions, starts to make its way into a tip grain near the point where the grain is attached to the cob. On feeding further into the grain it makes a straight burrow just large enough to hold it, and leaves a circular patch of skin or hull on the outside of the grain, which can easily be pushed aside by the mature moth when ready to emerge. The size attained by the larva seems to be determined by the size of the grain it enters. In wheat or in the small tip grains on the ear of maize the lava grows no longer than ⅜ inch, but the writer has seen larvæ in large maize grains over ½ inch in length. The larva is easily distinguished from the weevil grub by its greater length, cylindrical shape, and annulated or ringed appearance. Two or three larvæ are often seen in a single maize grain, and the characteristic sign of their presence is always the circular piece of skin on the grain already referred to. Unlike the weevil grub, the moth larva usually leaves no sign of the point at which it enters the grain.

After eating its way through the grain in a straight line to the opposite side, the full-grown larva spins a light cocoon round itself and pupates, or goes through a resting stage, before changing into the adult moth. The larval or caterpillar stage usually lasts about three weeks, and the pupal stage a few days under favourable conditions; but, as in the case of the weevil, each stage may be prolonged when these conditions are absent.

The pupa is light brownish in colour, and, like the weevil pupa, seems to be more resistant to injury by fumigation or cold weather at this stage.

The moth is of a pale buff-brown colour, about ⅜ inch in length and ½ to ⅝ inch across the expanded wings. It also has a few dark-coloured markings on the forewings, and a fringe of hairs on the lower side of each pair of wings.

The grain moth works at a lower temperature than the weevil, and consequently does more damage during the winter, laying eggs when the weevil is inclined to be quiescent. For this reason, where the moth is troublesome it will be advisable to dry or cure the ears as quickly as possible and store in bins after fumigation. The seed will also require attention on the first signs of spring. It cannot be stated too often that when storing seed maize in bins it is essential to see that it does not contain so much moisture as will cause the grain to mould and blacken and the germ to die.

It seems also as if the grain moth in all stages (caterpillar, pupa, and moth) resists fumigation during the winter, when the temperature is low. It is therefore advisable to select a warm day for fumigation during the winter should that treatment be found necessary.

The damage to germination done by the moth larva is not as great as that done by the weevil, on account of the narrow, straight boring of the former, usually through the starchy portion of the grain, and also because of the inability of the adult moth to do any further damage by boring. The writer has obtained a germination of 80 per cent. with seed maize damaged by grain moth; but as the percentage of germination is somewhat uncertain, the sowing of such seed is not recommended when better is available. Moreover, even presuming a good germination, the young plant must lose something in vigour when part of the reserve food material in the grain has been destroyed.

Fumigation with Carbon Bisulphide.

This is one of the most effective fumigants yet found for treating seed to rid it of insect pests without affecting its vitality or germination, provided due care is exercised in its use. It is a clear, foul-smelling liquid, which evaporates rapidly, giving off fumes that are poisonous when dense. The odour is like that of rotten eggs. If the fumigation is to be effective, the seed to be treated must be put in an *air-tight* bin or receptacle and fumigated for twenty-four hours. After this time the seed must be *exposed to the air again* to get rid of the fumes, which, if allowed to remain in contact with the seed for any length of time, will injure its germinating power.

The amount of carbon bisulphide to use depends, firstly, on the temperature. At ordinary temperatures (viz., 60 to 70 degrees Fahrenheit) 1 oz. (two large tablespoonfuls) is sufficient for 6 bushels of husked ears. In larger quantities, use 1 lb. of carbon bisulphide for 100 bushels of ear maize. Such a quantity takes up 250 cubic feet of space. If empty space (such as an empty bin) is to be fumigated, 1 lb. of liquid will suffice for 100 cubic feet, or 1 oz. for 6 cubic feet. If shelled grain is to be fumigated, use 1 oz. of the liquid to every 3 bushels of grain.

The quantities should be increased by half at lower temperatures, and at higher temperatures one-half to three-quarters of the amounts stated will be sufficient.

It will also be necessary to increase the quantities mentioned if the fumigating bin cannot be made air-tight. If a tight-fitting lid cannot be secured, a couple of heavy blankets on top of the bin will help to keep the fumes in.

The gas given off by the liquid is heavier than air, and the liquid should be placed in shallow vessels or poured on to cotton-waste on top of the seed to be heated. Contact with the grain has not been found to injure germination.

Fumigation is likely to be more effective during warmer weather on account of the greater activity of the pests, and a warm day should, if possible, be chosen for the purpose. If it can be avoided, it is advisable not to fumigate when the temperature is much below 60 degrees Fahrenheit.

As the eggs and pupæ are somewhat resistant to fumigation even at ordinary temperatures, a second treatment is recommended about ten days after the first in warm weather, but after a somewhat longer interval in cool weather. A very strong fumigation will injure the germinating power of the seed, but does not affect the grain as food for stock.

Caution.—It must be remembered that the liquid and the fumes are very inflammable, and that in an enclosed space they will ignite with explosive force if a flame comes in contact with them. Care must therefore be taken that no naked light is near—not even a pipe or cigarette—when the carbon bisulphide is being used or when the bin is opened.

The fumes cannot be inhaled to any extent by human beings with impunity. An overdose causes dizziness, numbing of the senses, and rapid heart beating.

The two important points to observe in the fumigation of seed with this chemical are:—

(1) The fumes must be got rid of by exposure to air after twenty-four hours' fumigation.

(2) For complete success, the fumigating bin must be air-tight.

In fumigating shelled grain it has been found that it packs down so tightly, especially at the bottom, that the gas has difficulty in penetrating to any depth. For this reason it is advisable to have the layer of grain as shallow as possible in depth, or if this cannot be arranged, to pour the liquid down pipes pushed into the grain to different levels.

The price of this chemical is 7d. per lb. in Sydney.

Hydrocyanic Acid Gas.

This is a poisonous gas made by mixing cyanide of potash and dilute sulphuric acid. It can be used similarly to carbon bisulphide, except that the fumes are lighter than air, and the gas should be made at the bottom of the fumigating bin. It possesses the advantage over carbon bisulphide that it is not inflammable, but owing to the trouble of making the gas and its dangerous nature if inhaled by human beings, its use is not recommended.

An improved method of fumigating with this gas is given in U.S. Dept. Agr. Bulletin 186 (1915). The fumigating chamber used is an iron cylinder from which the air is exhausted by means of a power-driven air pump. After the seed has been placed in the fumigator and the air exhausted, the necessary amount of dilute acid is introduced (by means of a stop-cock) to the cyanide contained in a vessel. By this means the poisonous gas is generated inside the tightly-closed chamber, and its penetration is much greater and quicker than when the fumigant is used under ordinary air pressure. It was found that fumigation by this method took only ten or fifteen minutes to kill all insects, and that the germination power of the seed was unaffected.

Naphthaline.

Naphthaline ("moth balls") has come into prominence recently as a useful substance for keeping stored seed free from weevil and moth. The only difficulty with its use is that the maize seed to be treated must be quite air-dry (down to 10 or 12 per cent. moisture) and fit for storage, as the treatment has to be carried out in an air-tight bin or receptacle, which is kept closed until the seed is required. The odour of the naphthaline thus fills the bin, and is deadly to all insect life; 1 lb. of naphthaline is sufficient to treat 100 cubic feet of ear maize, *i.e.*, about 40 bushels of corn. It should be scattered through the storage bin instead of being placed in one lot.

Where the maize is being used for seed it is not necessary to aerate the grain after treatment; but before feeding to stock the odour must be removed by exposure to the air.

Storage of seed with this substance has proved a very successful method of keeping seed maize on the Government farms in this State.

Naphthaline costs 1s. 3d. per lb. in Sydney.

Heat.

Some investigations conducted by Prof. G. Dean (*Jour. Econ. Ent.*, Apr., 1911) proved that adults of the rice weevil were killed at a temperature of 118 degrees Fah., while he found later (*Jour. Econ. Ent.*, Feb., 1913), that they cannot stand a temperature of 119 degrees Fahr. for more than two or three minutes.

At the Experiment Station, Salisbury (*Rhodesia Agr. Jour.*, Oct., 1915), experiments were carried out with natural heat, with the following results:—

Experiment 1.—14th April, 1 p.m. Temperature on a sail spread out on ground, exposed to sun, 116 degrees Fah. A sample of heavily-infested wheat was taken and spread out *thinly* on the sail. On touching the hot sail the weevils first exhibited a wild surprise; a few flew away, and the rest died in ten minutes. Being placed in a closed jar, no more had bred out by September, and the sample was quite free. The exposure had evidently killed the weevil in all its stages.

Experiment 2.—15th April. 106 degrees Fah. Only a few weevils died.

Experiment 3.—115 degrees Fah. Maize—a complete success.

Experiment 4.—115 degrees Fah. Wheat in layer ½ inch deep—weevils survived.

Similar results have been obtained with sun heat at Grafton Experiment Farm in this State, and this simple method of getting rid of weevils may be confidently recommended. A black tarpaulin will be found to absorb more heat than a white sheet.

Quicklime.

An experiment with the use of quicklime (freshly-burnt carbonate) in Noumea (*Bulletin d'Algérie*, Vol. 20, No. 11, June, 1914) is worth recording as an effective method of keeping down weevils and preserving maize, which might be applied on a smaller scale for keeping seed in similar tropical climates. In this experiment Mr. Lang sought a practical method suited to retard, if not to avoid, the blackening of grain due to excessive heat and moisture, and to minimise the attacks of weevils in order that the grain might be stored and utilised later.

Warmth and humidity being the two indispensable conditions for the development of mustiness, it was deemed sufficient to suppress one of them, and for preference the latter, in order to attain the desired end. Knowing the particular absorbing power of lime (quicklime), Mr. Lang had all the walls of a store whitened with this substance to a man's height, and at each of the four corners a barrel full of quicklime was placed. The lime absorbed the humidity, and the vitality of the pests was greatly reduced. A curious fact was the rapid disappearance of the musty smell, and the grain assumed its customary brightness. Three months after storing, 32 tons of maize presented the characters of a sample in good condition. In replacing the lime as soon as it appeared to lose its absorbing power, Mr. Lang used ten barrels of lime for treating 62 tons of maize.

Other Remedies for Weevil.

Other remedies, which are partly successful or which have not been sufficiently proved, include the use of salt, ashes, lime, cedar or pine twigs, superphosphate, kerosene, sulphur, carbonic acid gas, and chloride of lime.

The use of layers of coarse salt in storing maize in bulk is said to be efficacious in deterring weevils from attacking it, and the method has been practised in some parts of Queensland. It is not known whether any definite experiments have been carried out with it, but it must be remembered that if salt is allowed to come into contact with the grain it will injure its germinating capacity.

Ashes, lime, and cedar or pine twigs have also been used in the same way as deterrents, but nothing definite is known of their efficacy.

The storage of maize in old superphosphate bags is a crude method, which is said by some to give good results, but the contact of the grain with the superphosphate for any length of time is known to have an injurious effect on germination.

Kerosene has been used, and has also been found to kill the germ of the grain; but it is believed that the use of kerosene vapour has been attended with some success in the keeping of seed maize in Fiji.

The use of sulphur dioxide gas, formed by burning sulphur, or the use of sulphur itself cannot be recommended, owing to the germinating power of the seed being destroyed.

Carbonic acid gas, formed in a closed tank by allowing a candle to burn itself out after sealing has been tried; but many failures have resulted from having the moisture content of the stored grain too high, with the consequent development of mould inside the tank.

Chloride of lime suggests itself as being worth a trial on a small scale for keeping seed, on account of its high moisture-absorbing power.

Conclusion.

Of all the methods given here for the keeping of seed free from weevil and other insect pests, fumigation with carbon bisulphide and the use of sun heat, with subsequent storage with naphthaline, are the best than can be recommended. No trouble has ever been experienced with these treatments in keeping seed maize at Grafton, where the climate is distinctly favourable to the growth and development of insect pests.

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

Groundsel (*Senecio vulgaris* L.).

(COMPOSITÆ : Daisy Family.)

Popular description.—A very common annual on cultivated and waste ground. From 6 to 12 inches high, its stems are furrowed and bearing half-clasping pinnatifid leaves. Its flower-heads are composed of a number of small yellow flowers which ripen quickly and are distributed by the wind. Each plant keeps on flowering during several months of the year, and it is usual in spring and summer to find heads in all stages of development upon the same plant.

Botanical description.—An erect, nearly glabrous annual. Leaves irregularly pinnatifid and toothed. Flower-heads in close terminal corymbs or clusters. Involucre cylindrical. Florets all tubular and bisexual.

Vernacular Names.—The name Groundsel is in almost universal use in Britain, and has doubtless been employed for many more than a thousand years. It is of Anglo-Saxon origin, and the syllable " sel " is from a root signifying " to swallow," since the plant was considered valuable when taken internally for " a running of the eye."

" In several parts of England it is called Simson, apparently a corruption of the Latin *Senecio*, perhaps through the medium of the French Senesson." —(Sowerby.)

Where found.—It is a native of Europe and Russian Asia.

" Everyone knows the common Groundsel, a weed found in all kinds of cultivated ground in Britain, as well as on banks by roadsides and similar places."—(Sowerby.) This also expresses the situations in which it is found in New South Wales. Although abundant near houses, it is not an aggressive weed, and can certainly not be looked upon as a serious pest by the agriculturist.

Native Senecios.—We have many native *Senecios*, there being no less than eighteen species in New South Wales, without including varieties, but it is generally reported that stock will not touch them.

On one which in the Armidale district had become so plentiful as to exclude almost every other plant, I reported as follows a few years ago :—

" I have never heard of a native *Senecio* (which belongs to the Daisy Family) being reported as injurious to animals. An allied plant, *Senecio Jacobœa*, though a weed, is eaten by sheep in England without injury, although in New Zealand it is reputed as inducing cirrhosis of the liver in stock.

" In the present case what has probably happened is this. The ordinary herbaceous vegetation (including grasses) edible by stock may be mainly composed of annuals depending on the annual production of seeds, and consequently not able to withstand cropping by animals beyond a certain point

"There are certain plants, of which the present one is an example, which provide themselves with a defence against herbivorous animals in the shape of bitter or acrid or other deleterious properties, or strong smelling oils, or resinous exudations, or a covering of hairs or spines. These being not interfered with by animals go on to the seeding stage and take the place of the fodder plants which are either eaten out or have not been permitted to propagate their kind. The ripening of this weed-seed may of course take place some distance away, but makes the presence of seedlings from this weed-seed obvious to a lessee when he sees them actually spring up on his property where they have taken the place of the forage plants which have been eaten out.

"From what I have said you will observe that no remedial measure of the 'press-the-button' order is applicable in this case."

Economic aspects of Senecio.—Sowerby wrote of Groundsel over a century ago:—" It is annual, and flowers almost all the year round. The flower-buds and young tops are the food of many small birds and are given to canary-birds and others in a state of confinement." This is no unimportant use, for the welfare of small cage-birds affords great pleasure to many people.

We are also interested in two introduced species—one a yellow flowering ivy-leaved creeper (*Senecio scandens*), which has made itself very much at home in many parts of coastal New South Wales, not far from the sea, and which is often called "Cape Ivy"; it comes from the Cape of Good Hope, but it is not a true ivy of course.

The other is the Ragwort (*S. Jacobæa*), which is common in Victoria, but so far as I know, it has not been officially recorded as having made its appearance in New South Wales, although I am perfectly certain it is in this State.

In the Cape of Good Hope species of *Senecio* are recorded as having induced cirrhosis of the liver in stock, and in New Zealand *S. Jacobæa* is blamed for the similar and fatal complaint amongst horses known as "Winton disease."

It will thus be seen that at least one species of *Senecio* has fallen under suspicion, and, bearing in mind the fact that the properties of one species of a genus are often shared more or less by other species, it is very possible that our Groundsel contains some principle worthy of investigation.

In this *Gazette* (October, 1898) I published the following paragraph:—

> An extract is prepared from the plant and roots of the European *Senecio vulgaris* (Common Groundsel), which is used medicinally in some ailments peculiar to women. See Dalché and Heim (*Nouv. remèdes*, 1896, pp. 409 and 697), *Therap. Monatshefte*, 1897, p. 275; also Merck's *Ann. Report*, 1897, p. 65.
>
> Our native species of *Senecio* are numerous and widely diffused; here is a suggested line of research for some of our medical practitioners.

Now, I do not wish to suggest that there is anything deadly lurking in the humble Groundsel, but I desire to emphasise the point that the examination of plants by chemical methods is even yet in its infancy, and I fully believe the plants all around us are coyly smiling at us, and that many of them contain active principles of great interest and perhaps of economic value; but the said principles can only be wooed and won by the chemist. As regards our plants, we are walking over nuggets, which, until we use our pick, will remain where they are.

I know no branch of science that is more likely to secure interesting, and perhaps economically valuable, and possibly, sensational results, than that of the chemist. For some lines of research it would be desirable that he should have pharmaceutical training, and he should be in close co-operation with the physiologist.

EXPLANATION OF PLATE.

Plant in Flower.

1. Stamens.
2. Tubular floret opened out, showing adnate stamens and bifid stigma.
3. Stigma.
4. Achene with the pappus hairs sessile on the top.
5. Involucre after the shedding of the seeds.

Prickly Lettuce (*Lactuca scariola* L.).

(COMPOSITÆ : Daisy Family.)

This weed was figured in black and white, and fully described in the *Gazette* for April, 1905. During the last twelve years I have found very little to add to this account, and the present drawing would not have been presented except for the reason that it was at one time contemplated to represent *all* our weeds by coloured drawings. At the same time the present plate usefully supplements the former one.

The surmise in that paper that it is spreading has been amply confirmed, especially during the last few years. Most of our correspondents simply report it as a new arrival, and are puzzled by it, but the consensus of opinion, where it is expressed at all, is that it is not wanted, although a few report that it has some forage value. In Britain, where it is a native (a doubtful one according to some), it has not been recorded as a fodder plant.

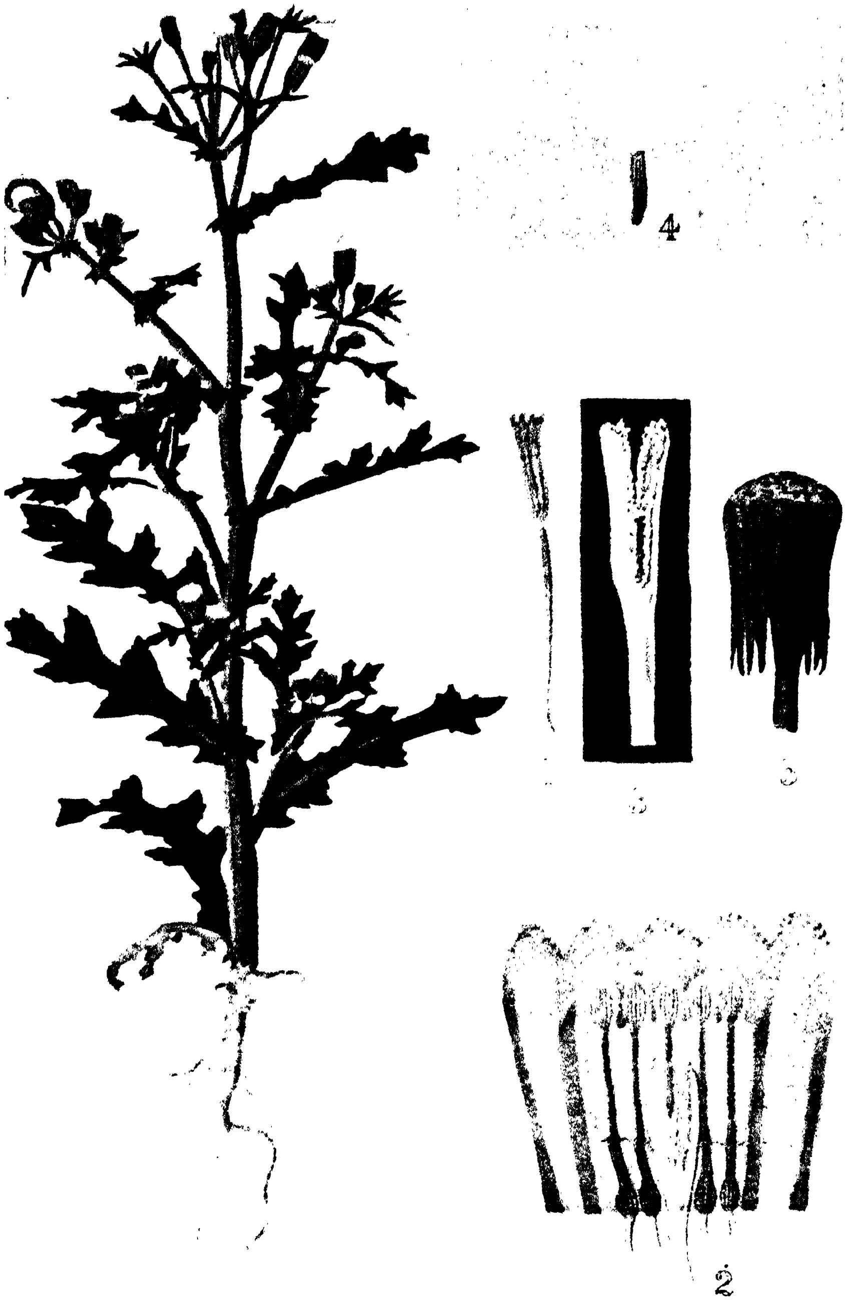
A whole countryside can be sown by one gust of wind from a few plants, hence it is difficult of control by man. If a man's land were free of it to-day, he cannot tell whether it will be not sown with it to-morrow. This remark applies to thistles and allied plants generally. If only a few plants are seen they should be cut down or eradicated before or during the flowering season. If the seed is already in the land, one can only hope that the precipitation of rain may not favour either the germination of the seed or the development of the plant, for certain periods in the life of every plant are critical as far as rainfall is concerned.

EXPLANATION OF PLATE.

Portion of plant showing foliage.

(Disposed Compass-like, *see* the 1905 paper.)

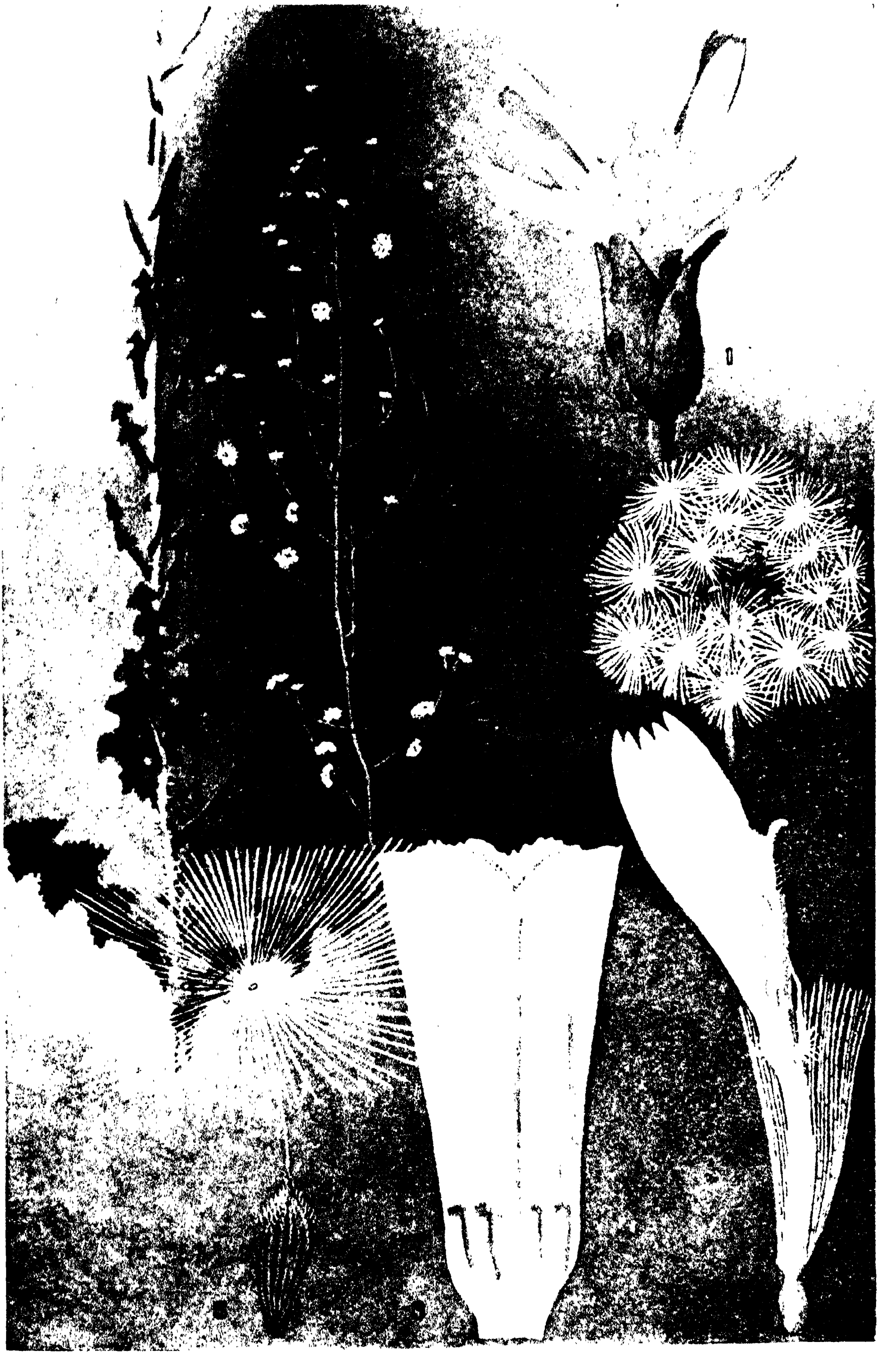
1. A single flower-head.
2. A single ligulate floret.
3. Floret opened out, showing stamens, style, and stigma.
4. Head of fruits (with their pappuses).
5. A single seed (fruit) with the pappus parachute appendage.



WEEDS OF NEW SOUTH WALES.

GROUNDSEL.

Senecio vulgaris L.



Weeds of New South Wales.

PRICKLY LETTUCE.

Lactuca scariola L.

Farmers' Experiment Plots.

WHEAT AND OAT HARVEST, 1916–17.

NORTH-WESTERN DISTRICT.

R. W. McDIARMID, Assistant Inspector.

DURING the past season the wheat experiments in the North-western division of the State were conducted on the farms of the undermentioned gentlemen:—

Mr. A. G. Warner, Gunnedah-road, Tamworth.
Mr. J. Perry, Walhallow-road, Quirindi.
Messrs. Bignall Bros., Tamworth-road, Manilla.
Messrs. Ormiston Bros., Quire-road, Gunnedah.
Mr. W. Penrose, Wean, Boggabri.
Mr. W. Palmer, Eulah Creek, Narrabri.
Mr. J. J. Carroll, Bohena Creek, Narrabri.
Mr. G. W. Grahame, "Bunabah," Wee Waa.
Mr. J. T. Maunder, "The Wilgas," Pallamallawa.
Mr. A. E. Weakley, Clifton Station, Currabubula.
Mr. J. F. Chick, "Hill View," Tenterfield.
Mr. A. J. Simpson, "Morelma," Inverell.

The Season.

Following the abnormally dry wheat season of 1915, when most of the crops in the north-west practically failed, came an excessively wet season, producing rank growth, much rust, and many lodged and tangled crops. The rainfall at each centre where the experiments were conducted is given in the following table:—

TABLE showing rainfall during 1916.

District.	Yearly average.	Jan.	Feb.	Mar.	Apl.	May.	Jne.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
	inches.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	inches.
Tamworth	27·82	339	230	149	310	10	401	319	240	351	262	365	380	33·56
Quirindi	27·02	128	191	..	245	89	365	187	282	262	145	195	728	27·67
Manilla	26·19	415	197	80	393	14	237	216	236	362	344	287	333	31·14
Gunnedah ..	24·98	100	286	124	292	12	263	348	356	286	178	288	437	29·65
Currabubula ..	...	176	134	46	265	..	245	232	219	163	217	239	..	19·36
Boggabri	23·34	——— Not available ———												
Narrabri	26·25	139	110	75	276	202	170	189	160	157	311	115	..	19·04
Wee Waa	24·13	128	126	98	75	..	214	484	173	239	244	544	440	27·15
Pallamallawa ..	....	98	152	208	418	14	310	341	223	198	254	233	..	24·39
Inverell	30·21	112	386	112	593	30	380	442	347	210	268	500	620	40·00
Tenterfield ..	33·13	261	420	118	358	177	305	194	195	151	353	356	355	32·38

A study of the table shows the uneven distribution of the rainfall, the autumn being rather dry in each district, and the falls being heaviest of all during the harvesting months, when fine weather is required. So much rain and cool weather during the spring and summer months delayed the ripening and harvesting of the crops, and during the second week of December, when the crops would in normal years have been harvested, very heavy and continuous rains fell all through the north-west, adding considerable injury to already badly-damaged crops. Shooting of the grain in the ears was fairly general, and many crops were never harvested. The most unfortunate districts were Inverell, Tamworth, and Quirindi. The most successful crops in each district were grown on the lighter soils.

The wet season naturally caused fungus diseases among the wheat crops, the worst being rust, flag-smut, take-all, and mildew. Rust caused considerable loss in each district, and mildew was probably next in the extent of the damage done.

The Various Plots.

Tamworth.—Here the plots were located about 7 miles from town on Mr. A. G. Warner's farm. The land had been cropped for wheat the previous year, and was fairly representative of the district. It was ploughed in January and again in May, with a harrowing after each ploughing. The seed was drilled in at 45 lb. per acre, without fertiliser, on 10th May. The growing crop was not fed off, though better results would have been obtained had that been done. The following varieties were sown, but it was impossible to harvest any with satisfaction, owing chiefly to their tangled and lodged state :—Federation, Hard Federation, Yandilla King, Nardoo, Bunyip, Canberra, Bunge, Major and Currawa. Both strains of Federation stood up well, but were so rusted that the grain was totally ruined. Major and Currawa were harvested together, but only portion of each could be gathered. Still they averaged six bags per acre.

The rainfall during the growing period is that recorded at the Tamworth post office ; it amounted to 19·48 inches.

Heavy yields were expected throughout the plots until the end of September, when the early varieties commenced to lodge, and each successive rain and wind storm added to the trouble. The first to lodge were Canberra, Bunge, and Bunyip, and the others soon followed suit, excepting Federation, Major and Currawa. The favourite varieties of the district—Federation and Yandilla King—failed hopelessly almost throughout the district. Still, that will not reduce the areas sown in future to any extent.

Quirindi.—The plots were situated 8 miles from Quirindi on the Walhallow-road, on dark loamy soil very rich in composition. It was cropped with wheat the previous year, but the returns were very light. The land was ploughed in February, cultivated later, and harrowed for sowing, which took place on 18th April at 45 lb. per acre, without manure. The varieties sown were : Rymer, Warren, King's Early, Improved Steinwedel, Sunset, Bunge, Bomen, Bunyip, Canberra, Hard Federation and Federation. Until the first week of November the plots were promising heavy yields, when lodging commenced with Warren, Canberra, Sunset, Bunyip and Rymer. Still, it would have been possible to have harvested the bulk of each plot had not such heavy rains fallen in December. Harvesting was commenced early in December, when Sunset, Bunyip and King's Early were taken off. Rain prevented further harvesting, and as flood waters crossed the plots more lodging and tangling followed and the grain commenced to grow in the heads. The yields obtained from the plots harvested will be found in the table on page 251.

It was expected that some plots, especially Bomen, would have yielded ten and twelve bags per acre, had it been possible to harvest them prior to the December rains. Bomen was the most rust-free of all, and stood up second to Federation.

Manilla.—The plots at Manilla were situated in the same place as the previous year, and here also heavy returns would have been the case had the weather been more favourable after the crops ripened off. The soil, which is rather light, had been cropped for wheat the previous year. It was ploughed in April and disc-cultivated later. Sowing took place on 11th May at 45 lb. of seed per acre without manure. In addition to the varieties mentioned in the main table, Commonwealth was sown at this centre, but without success. The early maturing varieties yielded best, but the late ones—Major and Rymer—would have given much better returns had the weather not damaged them so much just when ripe. Major was the outstanding variety here, and promised 10 bags per acre just before being ripe, but it is rather late for the Manilla district.

The rainfall during the growing period of the late varieties was 16·82 inches, and it was about one inch less for the early maturing ones.

Gunnedah.—In this district the plots were on light loamy to gravelly soil, and on the higher land. The paddock produced a three-bag crop in 1915. It was ploughed in April and disc-cultivated in May. Sowing took place on 20th June with 45 lb. of seed per acre and no manure.

The samples of grain from the early maturing varieties were very much better than those from the late varieties. Federation, Moira and Warden were very inferior samples. For hay purposes Warden was ideal, and would have returned fully 4 tons per acre. It and Moira are both too late for Gunnedah district. The big difference between the yields of the two types of Federation is due to the earliness of Hard Federation enabling it to a greater extent to escape the ravages of rust. The rainfall during the growing period amounted to 14½ inches.

Boggabri.—Here the plots were situated at Wean, about 18 miles from Boggabri. The paddock was cropped with wheat the previous year, and the stubble from that crop was ploughed under early in May, harrowed and drilled on 17th May without fertiliser at 45 lb. of seed per acre. Nine varieties were sown and the growth was most promising until after the heavy December rains, when the plots got knocked about considerably, and the grain in each plot commenced to grow in the heads. It was impossible to get the true yields, so harvesting them separately was not attempted. The most promising varieties were Bomen, Rymer and Canberra, while Bunyip, King's Early, Warren, Federation and Major were very bad. Hard Federation was much better than the old strain.

Narrabri.—Two sets of experiments were conducted in this district—one on Eulah Creek and the other on the edge of the scrub, near Bohena Creek.

On Eulah Creek, they were on Mr. W. Palmer's farm, 4 miles from Narrabri, the soil being light and loamy. The paddock was cropped the previous year with wheat. It was disc-ploughed during January and cultivated in March. Sowing took place on 8th May with 45 lb. of seed per acre, without manure. The germination was rather uneven, and the plots were rapidly fed off early in July with sheep. This made a more even stand and a better looking crop.

The early maturing varieties again yielded the best quality and the greatest quantity of grain, having escaped rust much more than the late varieties. The rainfall during the growing period of the early wheats amounted to 11·89 inches, and with the late varieties to about 13 inches.

At Mr. J. J. Carroll's farm the land had been cropped the previous year for the first time. It was ploughed in February and cultivated in March. Sowing took place on 8th May with 45 lb. seed per acre, and no manure.

The best samples of grain, as well as the highest yields, were produced by the early maturing wheats, the late varieties being very much affected by the rust, and the grain in consequence was very inferior.

Wee Waa.—The plots at Wee Waa were situated in the scrub country on Bunabah property. The land here was rather heavy and had been cropped the previous year for the first time since clearing. It was ploughed in January, and to break it down was harrowed several times after rains during the following months. Sowing took place on 15th May with 45 lb. of seed per acre, and no manure. The samples of grain were all good excepting the Federation, which was considerably pinched through the presence of rust. The rainfall at "Bunabah" amounted to 16¾ inches during the growing period.

Pallamallawa.—The plots were sown on Mr. J. T. Maunder's farm. The land was cropped to wheat in 1915 and ploughed in January, 1916, and again lightly, to destroy thistles, in April. The seed was drilled in on 1st May, without manure, at 45 lb. per acre of seed.

The growth was exceptionally heavy in these plots, and lodging was bad in almost every case. The only varieties that could be satisfactorily harvested were Bomen and the two types of Federation. Loss occurred in these plots, but it was slight compared with the loss through all the others. Rust and mildew caused a good deal of loss and pinched grain, especially in Federation. The best samples were harvested from Bomen, Canberra, Hard Federation, and Firbank. The frost affected Bunyip and Sunset. The rainfall recorded at Mr. A. J. Blunt's farm near-by amounted to 13¼ inches during the growing period—May to October inclusive.

Inverell.—In this district the experiments were conducted on "Morelma," the property of Mr. A. J. Simpson, near Mt. Russell. Only a portion of each plot could be harvested owing to the tangled and lodged condition of the crop.

The previous crop was wheat, and the land was ploughed on 2nd March, and cultivated in April and May. Sowing was conducted on 22nd May with 45 lb. of seed per acre, and no manure. The growth was exceptionally good until early in November, when trouble began, and by harvest time only portions of each plot were in a condition to be gathered. The varieties that best stood up against the weather were Federation (both types), Warden, Bomen and Rymer, whilst the most rust-free were Currawa, Warden, Bomen and Rymer. The rainfall during the growing period amounted to 27·17 inches.

Currabubula.—The experiments in this district were located about half way along the road from Currabubula to Gunnedah, on Mr. A. E. Weakley's property. The previous crop here was wheat in 1915, which returned three bags per acre. The land was ploughed in February, and disc-cultivated and harrowed in April. The seed was sown on 8th May without fertiliser, and at 45 lb. per acre. The growth was very good throughout, and tangling did not occur to any great extent, so most of each plot was harvested. Sunset variety was the worst. The best samples of grain were obtained from Canberra, Currawa, Rymer and Hard Federation. Rust occurred in each variety, but did not harm the crop very much. The rainfall during the growing period amounted to 10¾ inches for the early varieties, and 11½ inches for the late ones.

Tenterfield.—The experiments here were sown on Mr. J. Chick's farm, and were originally intended for hay trials. The land was previously cropped with maize, and fertilised with 1 cwt. superphosphate per acre. Ploughing was done on 9th May, and harrowing twice before sowing. The seed was drilled in at 50 lb. per acre, with about 50 lb. superphosphate on 8th June.

The rainfall during the growing period amounted to 15·54 inches with Firbank, and 19 inches in the case of the others. Rust did not affect these plots, and the samples of grain were particularly good. Most of the crops of the district were badly rusted, and the grain pinched.

TABLE Showing Results of Variety Trial, North-western District, 1916.

Variety.	Manilla.	Gunnedah.	Palmer, Narrabri.	Carroll, Narrabri.	Wee Waa.	Pallamallawa.	Inverell.	Quirindi.	Tenterfield.	Currabubula.	Tamworth.	Boggabri.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Federation	11 51	7 40	14 20	4 42	7 51	18 48	4 0	*	..	20 36	*	*
Hard Federation ..	16 18	15 58	17 3	6 26	15 34	20 41	5 0	*	..	21 44	*	*
Canberra	11 15	17 19	23 30	15 11	22 44	8 56	*	*	..	24 53	*	*
Bunyip	..	20 15	..	15 40	12 42	13 41	6 0	18 50	..	..	*	*
Bomen	..	14 11	..	..	10 0	27 34	17 0	*	..	..	..	*
Bunge	9 28	15 53	..	12 46	20 0	9 4	11 0	*	..	18 0	*	..
Rymer	5 21	..	11 32	7 35	..	..	10 0	*	..	22 46	..	*
Sunset	..	..	17 58	12 27	12 30	11 32	..	13 57	..	7 7	..	..
Currawa	..	16 58	..	..	..	..	11 0	..	..	20 30	18 0	..
King's Early	..	..	17 19	10 40	15 27	6 12	..	6 27	..	..	..	*
Nardoo	..	..	11 47	..	..	10 45	4 0	..	..	..	*	..
Warren	..	16 59	22 33	..	..	..	..	*	..	..	..	*
Warden	4 40	7 17	.	..	..	..	15 0	..	..	..	..	..
Zealand	8 16	..	..	..	..	..	..	..	20 30	..	..	..
Major	10 46	..	..	..	..	..	..	..	..	..	18 0	*
Firbank	..	..	..	..	14 20	8 12	..	..	18 45	..	..	..
Steinwedel	..	..	16 43	12 26	..	..	..	*	..	..	..	..
Moira	..	4 34	..	..	..	..	..	..	..	..	..	..
Cleveland	..	..	..	..	..	..	..	..	24 3	..	..	..
Marshall's No. 3 ..	7 40	..	..	..	..	..	..	..	..	..	..	..
Haynes' Blue-stem ..	..	..	..	..	..	..	..	..	18 23	..	..	..
Yandilla King ..	..	..	..	..	..	..	..	..	..	..	*	..

* The crop failed.

Liming Experiments.

Several special trials were conducted, including a liming experiment, fertiliser trials, graded *versus* ungraded seed wheat, and short fallow *versus* no fallow.

The liming experiment was conducted at Manilla, being a continuation of the experiment commenced in 1915 at Messrs. Bignall Bros. No lime was applied in 1916, the object being to ascertain the effect of that applied the previous year. The following yields were obtained in 1915 and 1916 from each plot :—

Dressing.	Yield.			
	1915.		1916.	
	bus.	lb.	bus.	lb.
1 Ton lime per acre	22	43	7	15
½ ,, ,, ...	20	53	7	21
No lime	19	55	7	40

The results so far do not favour the use of lime for wheat at Manilla, although the 1916 results can scarcely be considered, for the variety—Marshall's No. 3—was badly damaged by the rust.

Fertiliser Trials.

The use of artificial fertilisers in the north-west is very limited, and it was only on the lighter soils that trials were made. The experiments were sown with Federation wheat, 45 lb. of seed per acre. The following results were obtained :—

Fertiliser.	Gunnedah.	Narrabri.	Wee Waa.	Currabubula.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Nil	7 40	6 26	15 34	20 36
30 lb. Superphosphate ...	9 4	6 26	16 40	17 0

Unfortunately, the rust affected the yields from Federation. Next year the fertiliser will be tested with an earlier maturing variety.

Graded *versus* Ungraded Seed.

This trial was also conducted with Federation wheat, and the yields were much affected by the rust.

	Narrabri.	Tamworth.
	bus. lb.	
Graded seed	14 20	Nil.
Ungraded seed	14 31	Nil.

Short Fallow *versus* No Fallow.

The dry summer of 1916 prevented early preparation of the land, and the early ploughing had to be done in February and the late ploughing in March. This experiment was conducted at Currabubula, with the following results :—

Non-fallowed land	18 bus. 42 lb.	per acre.
Short-fallowed land	20 bus. 36 lb.	,,

The variety used was Federation, 45 lb. of seed per acre and no manure. The increase in yield is not great, but should be sufficient to induce early preparation of the seed bed.

Notes on Varieties.

The varieties most affected by the rust were Commonwealth, Federation, Moira, King's Early, Steinwedel, Hard Federation, Nardoo, and Rymer. The degree of infection varied in each district, but Commonwealth, Federation, Moira, Nardoo and King's Early were practically ruined in each district. The early-maturing varieties generally escaped the rust, but were ultimately knocked down by the wind and rain, beyond hope of harvesting.

The most successful varieties were Bomen, Canberra, Hard Federation and Currawa. The weak-strawed varieties—Canberra, Bunge, Warren and Firbank—can only be recommended for the lighter soils, for they are too liable to lodge on the black and heavy soils.

Federation was badly damaged by mildew in the Pallamallawa district; take-all and bunt were not very prevalent in any districts.

Conclusions.

Although the growers of Federation, Yandilla King, Steinwedel, Marshall's No. 3, Rymer, &c., suffered much loss through rust and weather, those varieties will not be discarded, for their success in ordinary years more than compensates for the loss in an exceptional year like the past.

The early-maturing varieties have again proved the most successful throughout the north-west. They may in some years be surpassed in yield by later varieties, but they will average higher returns over a number of years. The use of early-maturing varieties, and feeding-off with sheep where necessary, safeguards the growers of these varieties.

WESTERN DISTRICT.

R. G. MAY, Assistant Inspector of Agriculture.

EXPERIMENT plots in the Western District were arranged for by Mr. Assistant-Inspector Shaw, who has since volunteered and left the State on active service abroad. The plots included variety trials for grain and hay, cultivation trials, rates of seeding tests, manurial trials, and acclimatised *versus* introduced seed tests.

The following are the names and addresses of the farmers who co-operated with the Department in carrying out these experiments:—

Mr. D. A. Rich, "Roselayne," Curra Creek, Wellington.
Mr. J. Parslow, "Kelvin Grove," Gilgandra.
Mr. A. Milgate, "Rock Vale," Coradgery, *via* Parkes.
Mr. S. G. McCauley, "Osterley," Ootha.
Mr. S. Reilly, junior, Eurimbla Roadside, *via* Cumnock.
Mr. M. F. Dalton, "Duntryleague," Orange.
Mr. W. Moss, "Hillview," Parkes.
Mr. T. Bragg, Mungeribar.

Owing to extensive lodging of the plots on the farms of Messrs. W. Moss, Parkes, and T. Bragg, Mungeribar, accurate results were unobtainable, and they are not included in the following tables.

Cultural Notes.

Wellington.—Soil, strong red loam; disc-ploughed 4 inches deep, September, 1915; spring-toothed, 11th October; spring-toothed, 5th February, 1916; spring-toothed, 20th March; spring-toothed in front of drill, 9th and 10th May.

Gilgandra.—Soil, chocolate loam; mouldboard ploughed early in July, 1915; one-way disced, 6th September; spring-toothed, 14th October; one-way disced, 20th January, 1916; spring-toothed, 29th April; spring-toothed in front of drill, 11th and 12th May.

Eurimbla.—Soil, red loam; disc-ploughed 5 inches deep, in July, 1915; one-way disced, 16th August; spring-toothed, 14th October; spring-toothed, 20th January, 1916; spring-toothed, 29th April; cultivated and drilled, 16th May.

Orange.—Soil, light red loam; disc-ploughed, 13th September, 1915; spring-toothed, 12th October; harrowed, 17th November; skim ploughed, 12th February, 1916; harrowed and drilled, 16th May.

Coradgery.—Mouldboard ploughed 4 to 5 inches deep, 2nd to 12th June, 1915; spring-toothed, 28th to 30th September; sheep on fallow, November and December; spring-toothed, 30th March and 1st April, 1916; cross-cultivated with spring-tooth, 2nd to 4th May; drilled, 24th and 25th May.

Ootha.—Soil, red loam. Fallowed land worked thus: Disc-ploughed 4 inches deep, 30th July, 1915; spring-toothed, 15th August; one-way disced, 5th January, 1916; spring-toothed, 9th March; one-way disced and harrowed, 12th to 16th May. Unfallowed land worked thus: Disc-ploughed 4 inches deep on 9th February, 1916; spring-toothed, 7th March; spring-toothed and harrowed, 12th to 16th May. The unworked fallow was very hard and weedy previous to the last working.

The Season.

The season under review was remarkable for the amount of rainfall and the number of days on which rain fell during the growing period of the crops and during harvest. The continual moist weather was responsible for a serious invasion of rust (*Puccinia graminis*), which, almost without exception, seriously reduced the yields. In conjunction with rust, great damage was caused through the lodging of plots by wind and rainstorms, and at Eurimbla particularly a loss of from 3½ to 4 bushels per acre is attributable to a hailstorm. The last was probably also experienced in other localities, but the many passing storms were so various in nature that it is impossible to strictly attribute any damage to hail elsewhere than at Eurimbla. Good germination was obtained everywhere, and the growth was luxuriant and excessive. Practically all early and seasonably sown wheats lodged extensively, heavy and constant wet weather occurring soon after the wheats came out of the shot blade. The ripening season was of long duration, the weather experienced being mild, and thus holding the grain back from maturity. Even when the crop was ready for the harvester, operations could not be proceeded with until the first week in December, and considerable delay was experienced even after a start had been made on account of the constantly recurring wet weather. Especial attention is drawn to the results obtained on the farm of Mr. J. Parslow, Gilgandra. The road adjoining the plots had been formed just before the heavy rains commenced, and the effect of this was to throw all the drainage water across the central portion of the plots, so that practically for the major part of the season the plots on this area were growing in supersaturated soil. At each end of the plots the ground was slightly higher. On the eastern end the plots of Canberra (unfallowed), Hard Federation (unfallowed), and Hard Federation (fallowed) occupied this higher ground, and on the western end it was a plot of Yandilla King that was favoured. The higher yields of these plots are due to the slight drainage they thus had. The intervening plots were attacked by powdery mildew (*Erisyphe graminis*) and aphides in the early part of the season, and later all plots shared badly in the general rust attack. On one occasion the plot of King's Red, after lodging, was entirely covered by flowing water. Under such circumstances Currawa gave an excellent result in returning an acre-yield of 25 bushels 22 lb.; Major adjoining yielded 17 bushels 34 lb. The returns obtained from these varieties under adverse conditions seem to afford assurance of a good future for them.

The excessive rains were responsible for the results. These were generally below expectations. In particular, crops on fallowed land grew so luxuriantly that they lodged and were thus more favourably placed for rusting and for loss in harvesting. The difference between manured and unmanured plots is also less marked than we are accustomed to expect. Under the conditions experienced, the value of the experiment work is minimised. Nevertheless, extensive knowledge has been gained of the qualities of the different varieties under conditions of excessive rainfall. Mention may be made of the difficulties experienced in harvest operations. On account of the extensive lodging and the tangled nature of the early maturing and of the weak-strawed late-maturing varieties, the use of false combs on the harvesting machinery was necessary. These varied from combs home-made with saplings to sets provided by the manufacturers of the different makes of machines. Good results were obtained from all makes, but in certain cases false combs made locally by the blacksmith proved most efficient. Many devices were resorted to in order to secure the best results, such as removing alternate fingers, putting in alternate narrow-fingers, &c. All met with some measure of success, according to the state of the crop to be harvested. In many instances plots had to be harvested by running the machine only against the direction in which the straw was lodged. It can be seen that losses were unavoidable in harvesting, but approximately the amount of grain lost would be about equal on damaged plots, and the results can be taken as a fair guide to the value of the experiments.

TABLE I.—Showing Rainfall figures for 1916.

Locality.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	
Gilgandra ...	56	95	14	377	109	595	369	177	255	288	287	325	29·47 inches.
Wellington ..	136	31	Nil.	242	51	806	511	325	243	422	301	296	33·64 ,,
Orange ...	338	142	147	374	76	1,238	591	719	284	565	506	438	54·18 ,,
Eurimbla ...	130	134	37	265	57	867	523	239	335	314	326	297	35·24 ,,
Coradgery ...	101	114	54	394	76	583	326	321	266	385	282	247	31·49 ,,
Ootha ...	84	81	40	370	74	374	264	180	249	335	139	289	24·79 ,,

TABLE II.—Showing total Rainfall during the growing period.

Locality.	Rainfall during growing period.	Number of days on which rain fell.
Gilgandra	20·80 inches	42
Wellington	26·59 ,,	57
Orange	44·17 ,,	78
Eurimbla	27·73 ,,	61
Coradgery	21·63 ,,	62
Ootha	15·41 ,,	46

Variety Trials.

Reference to Table III will show the results obtained from the different varieties. The standard variety Federation has given extreme results where tried. At Eurimbla, where the plots were well drained and rust did not cause much damage, an acre yield of 35 bushels 34 lb. was obtained of plump, even grain, whilst at Gilgandra the yield was 8 bushels 13 lb., the grain being badly pinched and a very poor sample, the plot having been swamped with rain and damaged a great deal by rust. Major and Currawa gave good results under trying conditions. Canberra, in spite of lodging extensively, gave very satisfactory returns under the circumstances, as also did Florence and King's Red, the grain from each being plump and of good quality. Florence deserves mention for the high rust-resistant qualities shown. Yandilla King, in common with its half-sister Federation, suffered severely from rust. Steinwedel, Improved Steinwedel, Dart's Imperial, Moira, Warden and Marshall's No. 3 returned grain which showed to a marked degree the effects of the attacks of rust.

Notes on Varieties.

Sunset.—This is the earliest maturing variety sown. Having a very weak straw, it lodged extensively, and as the season advanced each successive storm beat the straw more to the ground. At Ootha a plot of this variety was the only wheat not harvested, being too much damaged by the weather. The grain samples secured were of good plump grain, not showing many signs of weathering. Rust affected the straw considerably, but the maturity of the grain was too early for any effects of rusting to be noticed.

Florence gave good results. It withstood the attacks of rust in a noticeable degree. The straw, however, was much knocked about by storms. The grain held well, was plump, and did not show much bleaching.

Canberra, as did all the early-maturing varieties, lodged to a considerable extent in all the plots. The straw was tough enough to withstand the use of false combs in harvesting, without allowing of much loss. The grain held well, was plump, and did not show much sign of weathering. Rust affected the straw but not the grain.

King's Red.—This South Australian bearded wheat, an early maturer, also lodged badly. The sample of grain was good and not much bleached. The straw was rusted.

Steinwedel did not stand the adverse conditions at all well. A large percentage of straws "kinked" at the lower internodes and broke down, so that the heads were quite lost to the harvester. The standing crop was badly tangled in all cases by wind and rain-storms. The grain samples obtained were pinched by rust.

Improved Steinwedel compared well with the old variety. There was practically no "kinking" of the straws and the grain was not so free as Steinwedel, which shells too freely. Wind-storms and rust affected the improved strain, tangling the straw and pinching the grain.

Warren was tried at Eurimbla and Ootha, giving best results comparatively at the latter locality. At Eurimbla a large percentage of the plants died back before the grain was properly formed. The balance of the plants that matured, lodged and proved very difficult to harvest. At Ootha the plot lodged considerably. Good samples of grain were secured at both places.

Hard Federation is a selection from Federation, possessing earlier maturing qualities, taller growth of straw, and a grain of better flour strength. It did not suffer from rust to such a pronounced extent as did Federation, though a noticeably large amount of flag smut occurred throughout all plots of this variety. A feature especially noticed throughout the harvesting of this variety was the small amount of chickwheat obtained.

Federation.—In the Gilgandra plot Federation gave the very poor return of 8 bushels 13 lb. per acre, whilst at Eurimbla a return of 35 bushels 34 lb. per acre was obtained. This difference is due to the severity of the rust attack at Gilgandra; at Eurimbla the attack was very light and much later in the season. Federation is a very tender wheat, readily susceptible to fungus diseases.

Marshall's No. 3.—This wheat also felt the effects of rust considerably, the grain sample being pinched and the straw much tangled and lodged.

Yandilla King is a half-sister to Federation, and, like that variety, it rusted badly, the grain samples being very pinched. The straw was considerably tangled and lodged.

Warden is a Victorian wheat, which promises well as a hay wheat, though it rusted badly. In the plots at Orange it was the variety most rusted at harvest time, and in the grain trials the samples obtained were rather pinched.

Moira is another Victorian wheat which seems very susceptible to rust and which does not promise so well as Major. The straw stood up well under the weather conditions.

Major is a most promising wheat of Victorian origin. The straw stood up well, and though rust developed, the grain showed little sign of pinching. In localities in which the plots were badly rusted, the samples of Major obtained were of good quality, noticeably in the Wellington plot, where it headed the list with 25 bushels 28 lb. per acre.

Dart's Imperial suffered severely from the attacks of rust in the only plot sown. The straw was badly rusted and the grain very pinched.

Cleveland was grown for hay and grain in the Orange and Eurimbla districts. This well-known variety kept up its reputation under adverse conditions. At Eurimbla, a hailstorm passed over the district a few days before harvest operations were carried out, causing an estimated loss of 3½ bushels to 4 bushels per acre. Rust did not appear to any great extent in this locality and practically caused no damage. The acre yield obtained from Cleveland was 40 bushels 7 lb., and this would have been increased but for the loss occasioned by hail. In hay trials at Orange, Warden gave slightly better returns, but it was rusted to a much greater extent than Cleveland and returned a poorer sample of hay. In both localities Cleveland withstood the wind and rain-storms remarkably well.

Huguenot, a Manitoba wheat with a solid straw, returned in hay trials 3½ tons to the acre. This yield was exceeded by both Warden and Cleveland. The hay sample was practically free from rust.

Zealand, in hay trials at Orange, gave good results, but the plot lodged extensively and the straw was freely rusted. A large amount of dead flag was present, interfering considerably with the quality of the hay.

TABLE III.—Showing the Results of Variety Trials.

Variety.	Coradgery.		Eurimbla.		Ootha.		Wellington		Gilgandra.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Canberra	24	24	30	13	15	1	21	38	12	41
Improved Steinwedel ...	17	42	....		7	4	....		....	
Warren	....		21	16	18	42	....		....	
Sunset	....		....		....		....		....	
Florence	....		....		24	39	....		....	
Steinwedel	....		30	19	8	34	....		....	
King's Red	....		....		13	9	....		9	20
Dart's Imperial	....		....		....		11	50	....	
Yandilla King...	14	30	34	44	....		12	13	12	33
Hard Federation	17	42	30	34	21	11	21	13	17	11
Federation	17	14	35	34	....		19	8	8	13
Warden	15	31	....		....		16	32	10	56
Moira	....		....		....		13	43	15	40
Major	17	45	....		....		25	28	17	34
Cleveland	....		40	7	....		....		....	
Marshall's No. 3	15	17	37	4	....		14	23	....	
Currawa	....		....		....		....		25	22

Manurial Trials.

Manurial trials were conducted, the object being to test the value of different amounts of superphosphate sown per acre as against no manure, and in one instance a sowing of Wellington rock phosphate was made. The results obtained from the manurial trials again supported the use of superphosphate, with the exception that at Wellington the unmanured plot gave slightly better returns than those manured with Wellington rock phosphate and with 70 lb. superphosphate per acre. With excessive soil moisture, superphosphate still has a markedly beneficial effect, though the general result of improved growth during the past season was to cause lodging of the crop. The use of superphosphate in no way appeared to lessen the liability to an attack of rust, beyond ensuring a stronger and more vigorous plant which was able to mature its grain better.

TABLE IV.—Showing the Results of Manurial Trials.

Locality.	Variety.	No Manure.	56 lb. Wellington Rock Phosphate.	28 lb. Superphosphate per acre.	42 lb. Superphosphate per acre.	56 lb. Superphosphate per acre	70 lb. Superphosphate per acre.	84 lb. Superphosphate per acre.
		bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Coradgery ...	Hard Federation ...	14 3	......	......	......	17 42	17 17	17 19
Eurimbla ...	Yandilla King ...	34 44	......	37 33	39 5	39 37	......	......
Ootha ...	Hard Federation ...	19 49	......	21 11	......	......	......	......
Wellington ...	Yandilla King ...	11 49	11 47	......	......	12 13	11 42	......
Gilgandra ...	Yandilla King ...	10 13	......	10 48	......	......	......	......

Rates of Seeding Trials.

One seeding trial was conducted and that in the Coradgery district. The variety experimented with was Yandilla King, and the following are the results secured :—

35 lb. seed per acre yielded 14 bus. 3 lb.
50 lb. ,, ,, ,, 14 ,, 30 ,,
60 lb. ,, ,, ,, 14 ,, 43 ,,

Acclimatised *versus* Introduced Seed Test.

Trials to ascertain what benefit is derived from sowing seed grown in the district as compared with seed grown under different climatic conditions and on different soils, were made at Gilgandra and Wellington. In two cases the introduced and earlier maturing wheat gave better returns than the locally-grown seed. The introduced seed matured about a week earlier than the acclimatised grain.

TABLE V.—Showing Results from Acclimatised *versus* Introduced Seed.

Locality.	Variety.	Acclimatised Seed. Yield per acre.	Introduced Seed. Yield per acre.
		bus. lb.	bus. lb.
Gilgandra ...	Canberra	10 5	12 41
	Yandilla King	12 33	10 48
Wellington	Canberra	21 1	21 38

Cultivation Trials.

Cultivation trials were carried out at Ootha and Gilgandra, one plot at each centre being fallowed and the other unfallowed. The results are contained in the accompanying table.

TABLE VI.—Showing Results from Fallowing Trials.

Locality.	Variety.	Fallowed. Yield per acre.	Unfallowed. Yield per acre.
		bus. lb.	bus. lb.
Ootha	Hard Federation ...	21 11	23 4
	Steinwedel	8 34	21 36
	Florence	24 39	22 8
	Sunset	Not harvested.	6 32
	Canberra	15 1	16 12
Gilgandra ...	Canberra	12 41	20 56
	Hard Federation	17 11	16 12

With such an abnormally wet season as that of 1916, the results from fallow land were not as good as would naturally be expected. The reason for the results on the fallowed plots being so low was that the crops grew more luxuriantly on such land than those on unfallowed land, and thus lodged earlier and to a greater extent, rendering it impossible to harvest all the grain.

Wheat and Oats for Hay and Oats for Grain.

Varieties of wheat and oats were sown at Orange for hay trials, and at Ootha an oat variety trial was conducted for grain results. The following are the returns secured :—

TABLE VII.—Showing Results of Trials of Wheats and Oats for Hay.

Locality.	Variety.	Manures. Per acre.	Hay. Yield per acre.
			t. c. q. lb.
Orange ...	Wheat—Huguenot ...	56 lb. superphosphate	3 10 1 9
	Warden ...	„ „ ...	3 18 2 15
	Zealand... ...	„ „ ...	3 10 1 14
	Yandilla King ...	„ „ ...	3 1 1 18
	Marshall's No. 3	„ „ ...	2 18 1 13
	Cleveland ...	„ „ ...	3 16 0 22
	„	No manure	3 3 0 14
	„	70 lb. superphosphate	3 3 2 1
	„	84 lb. „ ...	3 7 3 20
	Oats—Lachlan	56 lb. „ ...	3 1 3 25
	Guyra	„ „ ...	4 0 2 21
	Algerian	„ „ ...	4 10 2 10

TABLE VIII.—Showing Results of Oat Variety Trial at Ootha.

Variety.	Yield of Grain.
	bus. lb.
Algerian	46 17
Sunrise	27 25

The wheats and oats grown for hay trials at Orange survived the heavy wind, rain and hail storms very well. Warden lodged to a fair extent and Zealand slightly, the other wheaten varieties standing up well. Warden rusted badly and Zealand to a less extent, and again the balance of the wheats were less affected. Of all varieties, Cleveland had the best appearance and produced the best hay sample.

In the oaten hay trial, Lachlan lodged considerably and had to be reaped one way. Guyra stood up very well, although possessing heavy heads of grain. Algerian lodged badly and a very ragged stubble was left. It was estimated that quite 5 cwt. of hay was left as stubble. Algerian rusted considerably, but Guyra and Lachlan did so only to a slight extent. The best results from manure were secured by an application of 56 lb. superphosphate per acre.

At Ootha, plots of Algerian and Sunrise oats were sown and harvested for grain. Algerian rusted to a considerable extent and lodged slightly, whilst Sunrise lodged extensively but was free from rust. The low returns from Sunrise in comparison with Algerian were due to the extent to which this variety lodged. At Parkes also, Sunrise oats were rust-free, no trace of the fungus being found, though the plots were laid level with the ground, thus favouring the growth of the disease.

RIVERINA AND SOUTH-WESTERN SLOPES.

H. C. STENING, Inspector of Agriculture.

WHEAT experiments were conducted during the 1916 season in nineteen different districts throughout Riverina and South-western Slopes, the following being the names and addresses of the wheat growers who undertook to carry out the experiments on their farms in co-operation with the Department:—

Mr. M. J. Carew, "Selbourne," Deniliquin.
Mr. J. Charles, "Stoneleigh," Grong Grong.
Mr. W. Cruikshank, "Eurowie," Marsden.
Mr. R. O. Eulenstein, "Gracevale," Henty.
Messrs. J. A. Ford and D. Liebich, "Oxton Park," Murrumburrah.
Messrs. D. and J. Gagie, "Spy Hill," West Wyalong.
Messrs. F. Glenn and D. Glenn, junr., "Charville," Mathoura.
Mr. F. Gollasch, "Pine Park," Milbrulong.
Mr. E. W. L. Gordon, "Yanterilla," Tubbul.
Mr. A. Hannah, "Hillview," Nubba.
Mr. H. J. Horsburgh, "Wyuna," Beckom.
Messrs C. H. and A. Hulme, "Burnley," Holbrook.
Messrs. Johns Bros., "Wollongough," Ungarie (Mr. H. T. Robb, Manager).
Mr. J. Johnston, "Hillside Farm," Berrigan.
Mr. A. McDonald, "Bright View," Balldale.
Mr. B. J. Stocks, "Lindon Hills," Cunningham, *via* Harden.
Mr. W. Tait, "Stromness," Ringwood, *via* Corowa.
Mr. H. G. M. Thackeray, "Wootoona," Young.
Mr. E. G. Wenke, "Sunnyside," Walla Walla.

At Nubba a soil-liming experiment only was carried out, but in every other locality variety and fertiliser experiments were conducted, and on some farms additional tests were made—such as rate of seeding, crop-harrowing, fallowing *v.* non-fallowing, graded *v.* ungraded seed, acclimatised *v.* introduced seed, and early *v.* late sowing. At each centre the total number of plots was from thirteen to sixteen, each plot being ⅛ of an acre in area.

It was the intention to make two sowings in more than half of the districts, so as to allow of late and early maturing varieties being sown at seasonable periods, but unfortunately the date of the commencement of sowing was unavoidably delayed until 17th April, which did not allow sufficient time to make two sowings, except in two districts, viz., West Wyalong and Cunningham.

The Season.

Throughout the whole wheat-growing districts of the south, the 1916 season will be memorable on account of the magnitude of its rainfall. In most districts the precipitation during the growing period exceeded all past records. Heavy rains were experienced in some districts in the month of April, which ensured moist seed-beds and a ready germination. In the majority of districts, however, the summer and autumn rains were light, and sowings were made on dry seed-beds, a complete germination not being effected until the month of June. The scope of the April rains will be seen on reference to Table I, which indicates the character of the rainfalls during the period between ploughing and sowing.

TABLE I.—Showing the Rainfall during the Fallow Period, Riverina and South-western Slopes, 1915–16.

Month.	Ungarie.	Deniliquin.	Balldale.	Berrigan.	Beckom.	Ringwood.	West Wyalong.	Murrumburrah.	Young.	Henty.	Holbrook.	Tubbul.	Cunningham.	Mathoura.	Milbrulong.	Walla Walla.	Nubba.
1915.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
August	..	..	241	..	..	..	..	..	128	..	..	206	..	..	255	..	..
September	103	..	232	..	..	262	121	..	125	..	..	334	..	..	163	..	..
October	119	..	194	..	..	218	129	221	167	184	..	301	..	219	228	..	..
November	12	0	0	..	..	6	31	0	0	0	..	0	..	0	3	..	..
December	147	0	70	..	..	35	197	105	98	141	..	180	..	26	16	..	..
1916.																	
January .. .	134	71	72	160	85	94	124	130	189	52	50	152	129	83	80	53	163
February	8	84	120	157	93	117	0	50	85	64	88	16	160	17	116	114	125
March	41	12	66	30	70	39	74	100	100	58	114	110	107	14	48	87	86
April	129	16	215	98	35	160	140	567	472	60	164	496	616	0	54	163	448
May	..	55	90	67	..	70	..	..	..	..	149	..	3	82	..	126	73
Total during fallow period	693	238	1,300	..	..	1,001	816	1,173	1,359	559	..	1,795	..	441	963	..	..

At Deniliquin the rains during the fallow period were so light that they were of no value, but in every other district a good supply of moisture was conserved in the lower soil layers.

General rains fell on the night of 2nd June. By this date the sowings were complete, which was fortunate, for showers continued to fall throughout the month of June, preventing the satisfactory use of the seed-drill. Record rains were experienced during the winter months, the total rainfall almost doubling the average of the rainfalls for previous winters.

TABLE II.—Showing the Rainfalls during the Growing Period, Riverina and South-western Slopes, 1916.

Month.	Ungarie.	Deniliquin.	Balldale.	Berrigan.	Marsden.	Beckom.	Ringwood.	West Wyalong.	Murrumburrah.	Young.	Henty.	Holbrook.	Grong Grong.	Tubbul.	Cunningham.	Mathoura.	Milbrulong.	Walla Walla.	Nubba.
1916.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
April	..	..	..	..	65	..	..	53	..	..	..	..	..	..	..	..	0	0	..
May	70	6	0	9	80	53	0	79	94	94	75	..	88	104	82	41	76	..	73
June	330	261	362	339	425	332	387	312	419	527	475	506	385	503	499	267	358	502	483
July	174	191	323	212	237	238	346	220	409	340	249	384	196	356	414	211	166	354	349
August	227	171	302	168	372	422	258	278	426	351	359	422	419	534	464	207	318	407	389
September	247	189	362	298	170	403	424	252	220	222	382	344	401	289	241	402	394	319	212
October	267	176	393	249	285	265	304	210	315	341	340	453	346	473	341	174	347	400	348
November	221	166	287	230	75	282	395	208	458	259	383	527	362	280	309	203	402	325	314
December	..	..	92	..	..	..	..	..	430	273	204	260	..	..	234	..	..	204	257
Total during Growing Period ..	1,536	1,160	2,121	1,505	1,709	1,995	2,114	1,612	2,771	2,407	2,467	2,896	2,197	2,539	2,584	1,505	2,061	2,511	2,425
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	
Average yield of varieties ..	31 12	28 48	25 44	25 36	25 1	24 35	23 56	22 4	20 54	20 16	19 10	18 13	18 8	18 2	17 3	16 5	15 34	13 46	..

The mean average rainfall in the South-western Slopes for June, July, and August was reported by the Weather Bureau to be 1,469 points, as compared with an average for past winters of 720 points, while a mean of 852 points was recorded in the Riverina, as compared with the average of 479 points. In the districts in the vicinity of the main southern line the copious rains were largely in excess of requirements, greatly retarded the growth of the crops, and allowed very little opportunity for stooling. This was particularly the experience at Walla Walla and Henty, where the plots were located on low-lying land that was waterlogged throughout the winter.

Further west, where the rainfall was not quite so bountiful, the crops, favoured by a sufficiency of moisture and comparative absence of frosts, made very profuse growth, and at the beginning of November bumper yields were anticipated. However, in most instances this great promise was not realised, for a continuance of rains into the early summer months and the occurrence of violent wind-storms were responsible for a great diminution in the yields. Crops were laid flat or tangled badly, and conditions were provided favourable to the development of the rust fungus, which in some districts took its toll of the crops.

Wheat crops grown in plots are very susceptible to damage by wind-storms, for the spaces between the plots provide alleys along which the winds can vent their force. In a number of cases the damage done by wind-storms was so great as to prevent fair comparisons of the yields from being made, while in some instances the crop was so flat as to be practically beyond recovery.

Perhaps never before was there a season when the oft-heard remark, that a wheat crop is not safe until it is in the bags, was more applicable.

Table II (on page 263) shows the distribution of the rainfall as recorded at the farms where the experiments are conducted.

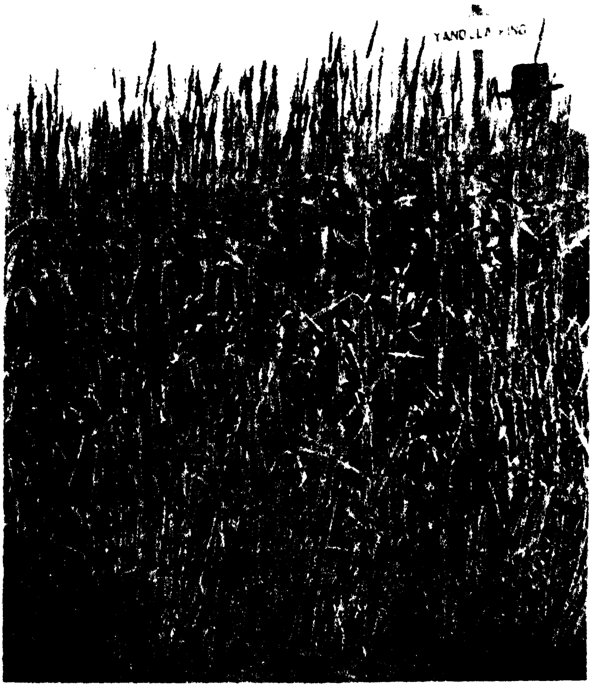
The records at Cunningham were incomplete, and the registrations at the Harden post-office have therefore been substituted. The average yield of the variety trials at each locality is also given, in order to show the relation of yield to rainfall. In five out of the six districts returning the highest average yields, the rainfall for the growing period was below 20 inches; the exception was Balldale, where the plots were located on very well drained ground. There were only two other districts, viz., West Wyalong and Mathoura, where the rainfall did not exceed 20 inches, and there the crops were so badly battered about by wind-storms that it was impossible to recover the whole of the yield. It would appear from this that a precipitation of more than 20 inches during the growing period was inimical to the production of high yields by crops grown on fallowed land.

Cultural Notes.

Ungarie.—Red loam; new land; ploughed 4 inches deep first week in September; spring-tooth cultivated first week in April; harrowed prior to drilling; drilled 5th May at rate of 48 lb. seed per acre; seed-bed dry and cloddy; harvested December. Slight attacks of mildew, rust and take-all. Sunset lodged badly; Bunyip and King's Early damaged by winds; Florence shed grain slightly.

Deniliquin.—Red clay loam; new land, previously wind-swept country of very light carrying capacity; ploughed 4 inches deep second week in September; harrowed 1st March; disced 1st May; rolled with sub-surface packer 8th May; harrowed prior to drilling; drilled 45 lb. seed per acre, 16th May, on dry seed-bed; crop harrowed early in August; harvested 25th December. Commonwealth germinated badly.

Balldale.—Red loam; cultivated previously for over ten years; ploughed 5½ inchesdeep in July; spring-tooth cultivated at end of March; spring-tooth cultivated at end of April; harrowed 22nd May; drilled 49 lb. seed per acre, 24th May, on moist seed-bed; harvested 4th January. Canberra, Bunge and Golden King lodged; Golden King, Federation and Major rusted.



Wheat Experiments at Young. Yandilla King, 31 bushels 22 lb. per acre.

Berrigan.—Red clay loam; previously in cultivation for twenty-two years; ploughed 4½ inches deep in July; disced in October; spring-tooth cultivated in March and again in April; drilled 48 lb. seed per acre, 20th May, on dry seed-bed; crop harrowed early in August; harvested 28th December. Commonwealth germinated poorly; all varieties except Federation and Commonwealth damaged by winds.

Marsden.—Dark red, very fertile clay loam ; new land ; ploughed 4 inches deep in August ; spring-tooth cultivated in November ; harrowed before drilling ; drilled 50 lb. seed per acre on moist seed-bed, 19th April ; crops fed off with sheep in June ; harvested 3rd January. All crops, excepting Federation (unmanured), badly damaged by winds ; Canberra and Golden Drop lodged completely ; Commonwealth, Federation and Hard Federation rusted.

Beckom.—Red loam ; new land ; ploughed 4 inches deep at end of June ; spring-tooth cultivated in October ; disced in February ; harrowed prior to drilling ; drilled 44 lb. seed per acre on slightly moist seed-bed, 29th April ; harvested in December. Commonwealth germinated poorly ; Bunyip lodged completely, and Canberra and King's Early were badly damaged by winds. All other varieties were slightly damaged, except Federation (unmanured).

Ringwood.—Red loam ; four crops grown previously ; ploughed 5 inches deep in August ; harrowed in October ; disced in April ; spike-rolled before sowing ; drilled 50 lb. seed per acre on 22nd May ; seed-bed slightly moist and lumpy. Canberra and Bunyip lodged completely ; Bunge, Hard Federation and Warden were damaged badly by winds ; Federation and Hard Federation rusted.

West Wyalong.—Part clay loam, part sandy loam ; new land ; ploughed 4½ inches deep in August ; harrowed in October ; spring-tooth cultivated in March ; drilled 52 lb. seed per acre on 17th April, and 62 lb. seed per acre on 30th May ; moist seed-beds ; harvested 15th December. Improved Steinwedel and Federation (manured in different plots with 42 lb., 56 lb., and 84 lb. superphosphate per acre) badly damaged by wind-storms ; Yandilla King slightly damaged.

Murrumburrah.—Grey to red sandy loam ; cultivated about thirty years ; ploughed in September and harrowed ; scarified in October and harrowed ; cultivated prior to sowing ; drilled at rate of 52 lb. seed per acre, 10th May ; moist seed-bed ; harvested 8th January. Crops suffered from excessive moisture and stooled sparsely ; Federation germinated poorly ; Federation and Hard Federation affected with rust ; Canberra and Hard Federation damaged by storms.

Young.—Red loam ; cropped three times previously ; ploughed 5½ inches deep in August ; harrowed in October ; scarified in February, and again at end of April ; drilled 49 lb. seed per acre, 2nd May ; moist seed-bed ; harvested 23rd December. Canberra lodged completely, and all crops, except Federation (unmanured), were badly damaged by storms ; Federation, a little rusted.

Henty.—Red loam ; cropped once previously ; ploughed 5 inches in first week in October ; harrowed at end of October ; spring-tooth cultivated in November, and again in May ; harrowed before sowing ; drilled 52 lb. seed per acre on dry seed-bed, on 13th May ; harvested early varieties 19th December, balance 29th December. Bunge lodged completely ; Canberra and Marshall's No. 3 badly damaged by storms ; Federation, Hard Federation and Major affected with rust.

Holbrook.—Grey loam; not previously cultivated for ten years; no fallowed; ploughed 4 inches deep in last week in May; harrowed prior to sowing; drilled 2nd June, on dry seed-bed at rate of 53 lb. seed per acre; fed off with sheep in August; crop harrowed in September; harvested 10th January. Yandilla King tangled; rust in evidence on all varieties, Cleveland and Canberra being least affected.

Grong Grong.—Red loam; six crops grown previously; ploughed 5½ inches deep at end of July; harrowed at end of August; spring-tooth cultivated in April; harrowed prior to drilling; drilled 47 lb. seed per acre on dry seed-bed on 25th April; harvested 16th December. Canberra lodged, and all crops, except Federation (unmanured), badly damaged by storms.

Wheat Experiments at Young. Moira, 28 bushels 42 lb. per acre.

Tubbul.—Red loam; three crops grown previously; ploughed 4½ inches deep at end of July; harrowed in October; spring-toothed in December, and again in April; drilled 52 lb. seed per acre on a moist seed-bed on 1st May; harvested 22nd December. Bunge and Canberra lodged completely, and all other crops, with exception of Federation (unmanured), badly damaged by storms.

Cunningham.—Grey to red sandy loam; two crops grown previously; ploughed 6 inches deep in August; harrowed in September; skim-ploughed in April; harrowed before drilling; drilled on moist seed-beds 48 lb. seed per acre on 9th May, and 58 lb. seed per acre on 31st May; harvested 13th January. Bunge and Canberra lodged completely; Marshall's No. 3, Currawa and Queen Fan badly damaged by storms. Rust in evidence; also take-all in patches.

Mathoura.—Red loam; old land; ploughed 4 inches deep in August and harrowed; disced in October; disced in May; harrowed before sowing; drilled on dry seed-bed 48 lb. seed per acre on 18th May; harvested 23rd December. Poor germination of Commonwealth; Bunyip, Canberra and Currawa lodged completely, and all other plots, excepting Federation (unmanured), badly damaged by storms.

Milbrulong.—Red loam; cultivated twenty-two years; ploughed 5 inches deep last week in July; harrowed 14th September; scarified 16th October; harrowed 23rd February; disced 26th April; all operations conducted after rain; drilled in slightly moist seed-bed on 26th April, at rate of 47 lb. seed per acre; harvested 25th December. Canberra, King's White and King's Red lodged completely; Hard Federation and Currawa badly damaged by storms; Federation, Hard Federation and Moira affected with rust.

Walla Walla.—Buff loam; cultivated for forty-eight years; ploughed 5 inches deep in October; harrowed end of January; scarified early in May; harrowed before drilling; drilled on moist seed-bed, 52 lb. seed per acre; harvested 5th January. Crops suffered from excessive moisture and stooled sparsely. Federation, Schmidt No. 1, Hard Federation, Moira, Yandilla King and Canberra rusted.

Variety Trials.

All varieties were manured with superphosphate at the rate of 56 lb. per acre in all districts, excepting Ungarie, Marsden, West Wyalong and Beckom, where 42 lb. per acre was the quantity applied.

The yields of Federation and Yandilla King will afford a basis for the comparison of the other varieties, but it would be unwise to draw conclusions from a comparison of any of the yields marked in the table with an asterisk (*), as that indicates that the crop was badly damaged by storms. The cool, moist conditions prevailing in the spring and early summer were responsible for the maturity of the crops being three or four weeks later than in normal seasons. The season was therefore all in favour of the varieties which require a long season for growth; consequently, late-maturing varieties, such as Yandilla King, Cleveland and Major, have returned the highest yields.

Partly for this reason, ***Federation*** has not returned as high yields as varieties of later maturity, but the chief cause of the lower yields of Federation in some districts has been the ravages of the rust fungus (***Puccinia graminis***), to which this variety is very liable. It is possible that some farmers may lose faith in Federation owing to its disappointing yields this season, the result of rust attacks; but it may be pointed out that there has not been an outbreak of rust in the southern districts that has done any

TABLE III.—Showing results of Variety Trials, Riverina and South-western Slopes, 1916.

(a) Early and Mid-season Sowing.

Variety.	Ungarie.		Deniliquin.		Balldale.		Berrigan.		Marsden.		Beckom.		Ringwood.		West Wyalong.		Murrumburrah.		Young.		Henty.		Holbrook.		Grong Grong.		Tubbul.		Cunningham.		Mathoura.		Milbrulong.		Walla Walla.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Yandilla King	36	0	36	22	34	51	30	0	26	37*	31	5	34	13	26	7	22	4	21	22*	19	52	14	45	30	41*	19	47*	19	35	18	48*	18	48	13	36
Federation.. ..	33	49	35	53	25	33	29	57	24	0*	25	15	22	52	19	44*	16	7	22	50*	17	57	18	23	21	12*	21	11*	18	53	19	10*	15	0	12	7
Canberra	35	44	31	6	18	1*	24	25	†		28	33*	†		..		19	41*	†		18	1*	20	19	†		†		..		†		†		13	39
Major	..		..		33	0	..		..		..		..		28	11	..		..		22	1	..		..		..		23	23	..		..		..	
Cleveland	..		..		..		..		..		..		.		.		25	48	..		..		26	53	..		..		19	51	..		..		..	
Currawa	..		32	50	26	45	27	9	26	43*	27	32	29	9	27	28	22	32	19	6*	19	0	19	11	23	41*	18	24*	11	39*	†		13	11*	15	45
Marshall's No. 3 ..	..		..		32	45	..		..		..		..		..		28	17	23	3*	21	0*	15	45	..		13	39*	12	57*	.		..		17	17
Warden	..		..		..		33	19	25	0*	..		21	16*	..		..		..		..		..		..		..		..		..		..		..	
Moira	..		..		..		..		..		..		..		..		..		23	42*	..		15	19	..		..		..		..		19	55	12	9
Improved Stein-wedel.	27	13	24	34	..		..		..		21	0*	..		10	48*	..		..		..		..		19	25*	..		..		..		..		..	
Bunyip	26	36	..		..		..		..		†		†		..		..		.		.		..		..		..		..		†		..		..	
King's Early White	29	45	23	56	..		27	17	..		25	0*	..		..		..		..		..		..		11	13*	..		..		..		†		..	
Commonwealth ..	..		24	9	..		10	7	20	0*	18	43	..		.		..		18	21*	..		..		..		..		..		10	31*	..		..	
Hard Federation ..	..		26	18	..		22	35	17	14*	..		21	51*	20	44*	13	55*	13	33*	14	0	15	13	19	8*	18	15*	..		17	57*	10	57*	11	13
Bomen	..		..		30	48	..		35	37*	..		..		..		23	55	..		21	32	..		..		16	56*	..		14	0*	..		17	0
Bunge	..		..		17	11*	..		..		..		14	17*	..		..		..		†		..		..		†		..		..		.		..	
King's Early Red ..	..		..		..		..		..		..		..		..		..		..		..		..		11	12*	..		..		..		†		..	
Florence	29	21	..		.		..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
Sunset	†		..		..		..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
Warren	..		24	3	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
Golden King ..	..		..		12	45*	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
Golden Drop ..	..		..		..		..		†		..		..		..		..		..		..		..		..		..		..		..		..		..	
Leak's Rust-proof..	.		..		..		..		..		..		..		..		..		..		..		..		..		..		12	7	..		..		..	
Queen Fan.. ..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		16	29*	..		..		..	
Schmidt No. 1 ..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..		..		..		11	24

* These crops were so badly damaged by wind-storms that the total yields could not be recovered by harvesters. The yields are therefore not strictly comparable.

† These crops lodged so completely that they could not be harvested satisfactorily.

material damage for very many years. Furthermore, the greatest loss by rust this season was the result of farmers sowing Federation too late, the effect being that these crops matured at a period when most subject to attack by rust. In spite of reduced yields, due to rust and damage by storms, the average yield of Federation on all plots was 22 bushels 13 lb., which exceeds the average of the previous year by nearly 1 bushel. Although the average of Federation is 3 bushels less than the average of Yandilla King on all plots this season; exactly the reverse was the case last year, when Federation beat Yandilla King by 3 bushels.

TABLE III.—Showing results of Variety Trials—*continued.*

(*b*) Late Sowing.

Variety.	West Wyalong.	Cunningham.
	bus. lb.	bus. lb.
Federation	22 44	18 35
Canberra	26 53	*
Bunyip	16 0	.....
Bunge	......	*

* These crops lodged so completely that they could not be harvested satisfactorily.

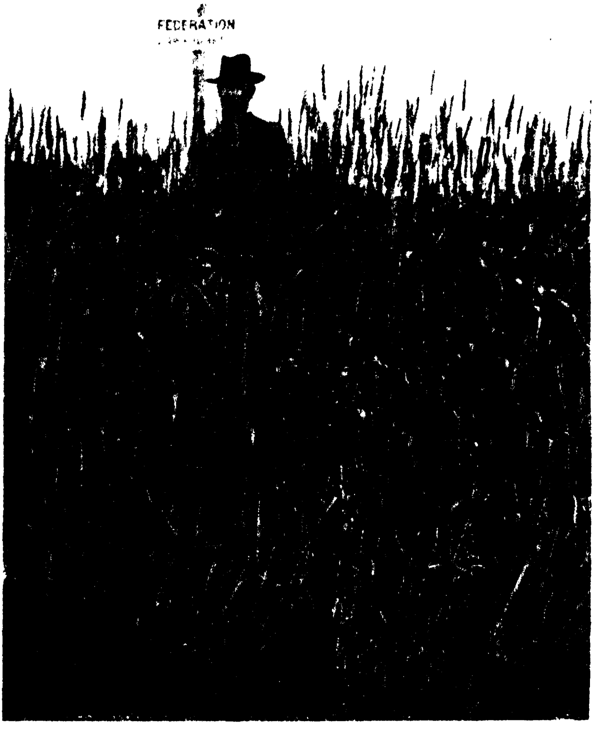
As *Yandilla King* may be regarded as the greatest rival to Federation as a grain yielder, a comparison of the averages of these two varieties on all plots for the past five years will be of interest:—

Year.	Federation.		Yandilla King.	
	bus.	lb.	bus.	lb.
1912	27	54	23	22
1913	21	49	24	6
1914	9	22	9	18
1915	21	20	18	12
1916	22	13	25	12
Average for five years ...	20	31	20	2

The averages for the five years are in favour of Federation to the extent of half a bushel. The nature of the spring and early summer rainfall is largely the deciding factor in the relative yields of these two varieties—cool moist, spring weather being favourable to the production of high yields by Yandilla King. The average yield of 25 bushels 12 lb. is the highest yet obtained from Yandilla King on the experiment plots in the South.

It is top yielder in six out of eighteen trials, and came second in four trials, being especially successful in the drier districts. Of the taller-growing wheats, it is one of those that withstood the storms most successfully; in those localities where it was damaged all other varieties suffered.

Of the other late maturing varieties, *Major* gave an excellent account of itself upon its first trial, being top yielder in three out of four trials, and coming second in the fourth case with a yield of 33 bushels. This variety, which is a cross between Federation and Wallace, made by Mr. H. Pye, Wheat Breeder to the Victorian Department of Agriculture, has a strong, stiff straw of medium height, and it stood up against the storms better than any other variety tested. It has an attractive, slightly clubbed ear, with the spikelets towards the tip crowded. It matures later than Yandilla King, and is rust-liable; but although the crop appeared to take rust badly, the grain was not badly pinched.



Wheat Experiments at Young. Federation, 22 bushels 50 lb. per acre.

Cleveland, which was tried in only three districts in the cooler portions of the South-western Slopes, gave splendid results, returning the highest yields in two trials, and coming second in the remaining one. It stood up very satisfactorily, and proved to be one of the best rust-resisters. It is a very late maturer, and in normal seasons would not be suitable for the drier areas.

Currawa did not behave very well in comparison with the varieties already mentioned, the yields not being as satisfactory as might be anticipated in a season so suitable for late maturers. It proved to be rather weak in the straw; portions of some crops lodged during the hay stage, and the ripened straw was also very brittle. At Mathoura where the crops lodged, it could not be handled satisfactorily owing to its brittle straw. It is fairly rust-resistant.

Marshall's No. 3 appears to be particularly suited to the eastern districts of the portion of the State under review. It was tested in eight of these districts and returned higher yields than Yandilla King in five trials. It possesses a weaker straw than Yandilla King, and consequently suffered more from boisterous weather.

Warden was tried in three districts and appears to be a splendid dual-purpose variety. It grows very tall and stands well when in the hay stage, producing heavy yields of good quality hay. It matures rather late to be of value as a hay variety for the grain farmer, but can be recommended strongly to the hay-grower. When ripened, the tall heavy crops lodged, but at Berrigan the crop was satisfactorily harvested wtih a reaper-thresher with false comb attached, and returned the highest yield, viz., 33 bushels 19 lb. It is fairly rust-resistant. This wheat was bred by Mr. H. Pye, over twenty years ago, and it is only of recent years that it has become popular in Victoria and portions of New South Wales, where excellent results have been obtained. It was produced by mating a Quartz x Ward's White crossbred with Red Bordeaux, the grain being of a reddish-brown colour.

Moira is another of Mr. Pye's crossbreds, being the result of crossing Purple Straw with an unfixed Fife-Indian crossbred. It was tested in four districts, in two of which it returned the highest yields. In the remaining two the yields suffered owing to rust infection, to which it is extremely liable. It stood up fairly satisfactorily.

Bomen stands out this season as a mid-season variety of great merit, on account of its great rust-resistance, and of its ability as a tall growing wheat to withstand storms ; it was damaged only in those localities where all other varieties suffered similarly. At Marsden, although it suffered loss of grain as the result of lodging, a yield of 35 bushels 37 lb. was returned, beating all other varieties tested there. It also came second in three other trials out of a total of seven trials. It is favoured by some farmers as a good yielder of hay, and the owner of a large chaff mill regards Bomen chaff with great favour, especially for blending. Bomen, therefore, can lay claim to being a particularly safe dual-purpose variety.

Commonwealth germinated very poorly, but although the stands were thin the grain produced in every instance was badly pinched as the result of rust attack, to which it is extremely liable. Three years' trials have proved this variety to be a poorer yielder than Federation, over which it possesses no other superior qualities, and it is, therefore, intended to discard it.

The early maturing varieties suffered severely from storms. Weakness of straw is characteristic of all early varieties in cultivation, and this was accentuated by reason of the fact that it was obligatory in most instances to sow these varieties too early. On the whole the early varieties were comparatively free from rust attack ; for this their early maturity is responsible ; the crops having passed the most susceptible stage for contracting the disease (the heading period) before conditions were favourable for the development of the fungus. Early-maturing varieties may thus be regarded as rust-escaping, provided sowing too late is avoided. More success is met with by early varieties in dry seasons, which are much more frequent than such a wet season as the past one. Moreover, early varieties fit in well with the farm economy, providing an extension of both the sowing and harvesting periods. Owing to the considerable damage by winds, satisfactory comparisons cannot be made between the yields of the early maturers, but some impressions could be formed from the appearance of the crops prior to the damage, and from a comparison of the yields in those localities where the crops were not damaged.

Canberra stands out as the best of the early-maturing varieties from a grain-yielding stand-point. At West Wyalong, where a late sowing was made, it yielded 9½ bushels more than Bunyip, and 4 bushels more than Federation sown at the same time. Owing to its weak straw it is very important that Canberra should not be sown until late in the season. It matured a little later than Bunyip.

King's Early is another early variety that did not strike a suitable season, and merits further trial. So far as yielding capacity and habit of growth is concerned there is a great similarity between King's Early White and King's Early Red, the only difference apparently being in the colour of the grain.

Hard Federation was not very successful as a yielder. Out of fourteen trials it only beat Federation in one instance, viz., West Wyalong, where the Federation crop sustained greater damage by winds, while Hard Federation was harvested just prior to a storm. As it matures earlier than Federation, Hard Federation is almost certain to give a better account of itself in a drier season. Its straw is much weaker than that of Federation, and consequently was more damaged by the storms. It is also rust-liable.

Improved Steinwedel—the pedigree of which, according to Mr. Pye (who evolved it) is (Steinwedel x Purple Straw) x Steinwedel—did not perform as well as is usually does under drier conditions. It is most suitable as a dual-purpose variety for the drier areas. In spite of the boisterous weather it held its grain satisfactorily ; but some of the crops tangled up badly, though no worse than any of the other early varieties.

Bunyip exhibited a very weak and brittle straw, and owing to its brittleness the lodged crops could not be satisfactorily handled with the false comb. In comparison with Canberra it yielded poorly.

Bunge also was very weak in the straw, and in addition does not hold its grain well.

Trials of *Florence* and *Sunset* were made at Ungarie only. Florence yielded satisfactorily, even though it shed its grain slightly. It stood well for an early variety. Sunset, which is very weak in the straw, went completely down, and could not be harvested.

Single trials only were made with Warren, Schmidt No. 1, Golden King, Golden Drop, Leak's Rust-proof, and Queen Fan, and according to their behaviour this season there is nothing to recommend them. Warren has a reputation as a drought-resister, and the season was therefore unsuitable.

Schmidt No. 1 has been tested for two seasons, and has failed to yield as well as Federation, which it resembles in many particulars. It holds its grain more loosely, possesses a more brittle straw, and it is every bit as rust-liable; as it possesses no qualities superior to Federation it may safely be discarded.

Golden King is a South Australian variety, with a brown ear and slight tip awns, somewhat resembling Viking. It is earlier than Federation, weaker in the straw, and is extremely rust-liable, returning the poorest yield at Balldale, with very pinched grain.

Golden Drop, which has a weak straw, lodged completely while in the hay stage, and was cut for hay.

Leak's Rust-proof is a selection made by Mr. D. Leak, of South Australia. Its habit of growth somewhat resembles Marshall's No. 3, and it is fairly rust-resistant. The term "rust-proof," however, is a misnomer, for there is no wheat known which is absolutely proof against rust attack.

Queen Fan is a South Australian crossbred—Fan x Carmichael's Eclipse. It is a late maturer with a tapering ear, and did not resist the storms very well.

Perhaps in no previous season in the southern districts has such an opportunity offered to test the ability of varieties to withstand storms and to resist rust. The best rust-resistors were Cleveland and Bomen, and the variety which stood best against storms was Major. Other varieties which proved good storm-resisters were Federation, Commonwealth, Cleveland, Yandilla King and Bomen.

Fallowing Tests.

In three districts one plot was left unfallowed to test the yield of the crop grown on this plot with the yield produced on fallowed land. At Milbrulong one plot, also of fallow, was left in an uncultivated condition until seeding time, to show the difference in yield of crops grown on well-cultivated fallow and neglected fallow.

In each instance the unfallowed plot was lea land, and had the same spell from cropping as the fallowed plot; therefore the test is not to be confounded with a test of fallow *v.* continuous cropping, in which the difference in yield might well be expected to be more marked.

It was decided that the unfallowed plot should be ploughed after the 1st March, at the first opportunity when the land was in a suitable condition for ploughing. At Walla Walla rain fell during the first week in April, when the unfallowed plot was ploughed, but at Milbrulong and Henty there was insufficient rain to put the land into condition for ploughing up to seeding time, and it therefore had to be ploughed in a dry condition just prior to sowing, when it turned up in such a rough cloddy condition that it required as much cultivation to bring it into satisfactory tilth as would ordinarily be expended in the proper cultivation of a fallow. For instance, at Milbrulong the land had to be rolled twice and scarified twice, and at Henty it was harrowed twice, and cultivated twice, and even after these operations the land was in a cloddy condition. This emphasises the advantage that fallowed land has over unfallowed land, in that the former is always in a satisfactory condition for sowing at whatever may be deemed the best period.

TABLE IV.—Showing Results of Fallowing Tests.

Locality.	Variety.	Yield per acre. Unfallowed.		Unworked Fallow.		Worked Fallow.	
		bus.	lb.	bus.	lb.	bus.	lb.
Milbrulong	Federation ...	13	3	13	16	15	0
Walla Walla	Yandilla King ...	11	0	......		13	36
Henty	Yandilla King ...	24	25	......		19	52

In a season with such a superabundance of rain, it may be rather surprising to find that increased yields of 15 per cent. and 23 per cent. respectively, have been returned by crops on fallowed land at Milbrulong and Walla Walla, more particularly so when the land was in a water-logged condition throughout the winter months as at Walla Walla. The increase cannot possibly be due to the influence of conserved moisture in the fallow, so the probable explanation is that the better yields are the results of the production of nitrates in the fallowed land. An increased supply of nitrates would especially be an advantage in such a wet season, and on soil that had been cultivated for a considerable number of years, as in the case of the two soils under review. At Henty, where the unfallowed plot gave a higher yield than the fallowed plot, the land had only been cropped once previously, and would doubtless be well supplied with nitrates.

The returns from the neglected fallow are very little better than from the unfallowed plot. It received only the cultivation before sowing, and the seed-bed was moister than the worked fallow, the moisture in the latter being stored in the lower soil layers, causing a delay in germination until rain fell. The unworked fallow therefore had the advantage of an earlier and more perfect germination.

Early *versus* Late Sowing.

This test was carried out with the mid-season variety Federation, early and late sowings being made in two localities, but in each instance the sowings were made within the normal sowing season of the particular district.

TABLE V.—Early *versus* Late Sowing Trials.

Locality.	Early Sowing. Date of Sowing.	Yield per acre.		Late Sowing. Date of Sowing.	Yield per acre.	
	1916.	bus.	lb.	1916.	bus.	lb.
West Wyalong ...	17 April	19	44*	30 May ...	22	44
Cunningham	9 May	18	53	31 May ...	18	35

* Crop damaged by wind-storms, and total yield could not be recovered by harvester.

At West Wyalong, the early sown crop was badly damaged by winds and is not comparable, while at Cunningham the yield is slightly in favour of early sowing. The season with its mild winter and spring rains was very favourable for late sown crops, but in most cases these were badly affected with rust, to which late sown crops are especially subject.

Acclimatised and Introduced Seed.

For the purpose of comparing the seed introduced into the district by the Department from Wagga Experiment Farm, plots were sown in four districts with seed that had been introduced to the district for the experiment plots two to three years previously, and that had since been carefully graded and grown in the district.

TABLE VI.—Acclimatised *versus* Introduced Seed.

Locality.	Variety.	Yield per acre.	
		Acclimatised Seed.	Introduced Seed.
		bus. lb.	bus. lb.
Deniliquin	Federation	36 6	35 53
West Wyalong	,, ...	20 57	19 44*
Holbrook	,, ..	16 37	18 23
Walla Walla	,, ...	12 37	12 7

* Crop damaged by wind-storms, and total yield could not be recovered by harvester.

The results are such that no definite conclusions can be formed. Omitting the results at West Wyalong, where the introduced crop was damaged, Holbrook is the only district where there is any decided difference, which would point to the conclusion that seed introduced from a drier locality is to be preferred to locally grown seed, which supports the result of a test in 1914.

Graded *versus* Ungraded Seed.

In order to determine the value of grading seed, plots of ungraded seed were sown in four districts. The ungraded seed used for comparison was Federation, the product of the same crops as the graded seed.

TABLE VII.—Graded *versus* Ungraded Seed.

Locality.	Variety.	Yield per acre.	
		Graded Seed.	Ungraded Seed.
		bus. lb.	bus. lb.
Berrigan	Federation	29 57	29 55
Ringwood	,, ...	22 52	22 37
West Wyalong	,, ...	19 44*	21 29
Grong Grong	,, ...	21 12*	22 40*

* Crop damaged by wind-storms, and total yield could not be recovered by harvester.

At Berrigan and Ringwood, the only two localities where the crops were not damaged and where the yields therefore were comparable, there was practically no difference in the yields. Further trials will be made, and until that is done it would not be wise to make a definite statement.

Rate of Seeding Tests.

In order to determine the best quantity of seed to sow per acre, three plots were sown in eight different districts at various rates of seeding—light, medium and heavy. The quantity of seed adopted for the medium sowing was what is considered a fair standard for the district and for the time of sowing. The light and heavy sowings were respectively 12 lb. below and 12 lb. above this standard, or as near to 12 lb. as the drill could be set to sow.

TABLE VIII.—Rate of Seeding Tests.

Locality.	Variety.	Date of Sowing.	Light Seeding.			Medium Seeding.			Heavy Seeding.		
			Seed per Acre.	Yield per Acre.		Seed per Acre.	Yield per Acre.		Seed per Acre.	Yield per Acre.	
		1916.		bus.	lb.		bus.	lb.		bus.	lb.
Ungarie ..	Federation ..	5 May..	36	33	32	48	33	49	60	33	51
Balldale ..	,, ..	24 ,, ..	38	24	39	50	25	33	02	26	12
Berrigan ..	,, ..	20 ,, ..	36	24	36	48	29	57	60	27	37
Marsden ..	,, ..	19 April	38	21	5*	50	24	0*	62	18	44*
Beckom ..	,, ..	29 ,, ..	32	25	24	44	25	15	56	28	5
Murrumburrah ..	Yandilla King ..	10 May..	40	23	9	52	22	4	64	21	8
Cunningham ..	,, .	9 ,, ..	36	20	49	48	19	53	60	18	40
Mathoura ..	Federation ..	18 ,, ..	36	19	0*	48	19	10*	60	16	56*
	Average ..	.. ..	..	24	1	..	24	57	..	23	54

* Crop damaged by wind-storms, and total yield could not be recovered by harvester.

In districts where the crops were badly damaged by winds it will be noticed that it was the plots of the heavy sowings that suffered most.

The medium seeding has given the highest average yield, bearing out the experience that 45 lb. to 55 lb. per acre, according to the time of sowing, is the best quantity for a moderate stooling variety like Federation; for good stooling varieties, lighter seedings are to be preferred.

Manurial Experiments.

In all districts, tests were carried out to determine the quality of superphosphate that should be applied to crops. Four to six plots were sown at each centre for this purpose, one being unmanured, a second being treated at the rate of 56 lb. superphosphate per acre, and the remainder receiving varying applications of superphosphate. In addition, trials were made in four districts with Wellington rock phosphate.

TABLE IX.—Manurial Experiments.

Locality.	Variety.	No manure.		28 lb. Superphosphate per acre.		42 lb. Superphosphate per acre.		56 lb. Superphosphate per acre.		70 lb. Superphosphate per acre.		84 lb. Superphosphate per acre.		112 lb. Superphosphate per acre.		56 lb. Wellington Rock Phosphate per acre.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Ungarie ..	Federation ..	30	33	33	49	83	49	34	2	33	56	..		..		..	
Deniliquin ..	,, ..	32	25	..		33	6	35	53	36	44	..		..		..	
Balldale ..	,, ..	19	16	..		25	7	25	33	26	19	..		..		..	
Berrigan ..	,, ..	24	19	..		29	17	29	57	27	12	..		..		..	
Marsden ..	,, ..	32	45	22	40*	24	0*	20	0*	17	23*	..		..		..	
Beckom ..	,, ..	17	45	..		25	15	24	20	27	53	..		..		..	
Ringwood ..	,, ..	20	25	..		21	1	22	52	22	13	21	31	..		..	
West Wyalong ..	,, ..	18	3	..		19	44*	20	52*	..		21	0*	..		..	
Murrumburrah ..	Yandilla King ..	15	47	..		19	55	22	4	21	5	..		20	39	17	12
Young ..	Federation ..	19	31	..		22	59*	22	50*	19	34*	23	44*	..		.	
Henty ..	Yandilla King ..	18	12	..		19	27	19	52	21	23	..		..		..	
Holbrook ..	,, .	14	20	..		14	26	14	45	..		15	25	..		14	44
Grong Grong ..	Federation ..	22	3	..		22	13*	21	12*	19	25*	17	36*	..		..	
Tubbul ..	,, ..	19	36	..		20	52*	21	11*	18	11*	15	4*	..		17	20*
Cunningham ..	Yandilla King .	16	15	.		18	29	19	35	..		18	0	..		..	
Mathoura ..	Federation .	18	53	..		16	57*	19	10*	19	25*	..		..		..	
Milbrulong ..	,, ..	9	36	..		15	29	15	0	13	49	14	9	13	51	..	
Walla Walla ..	Yandilla King ..	9	16	..		..		13	36	16	4	15	47	..		12	9
Average		19	56	..		..		22	22	..		..		..		..	
Average increase due to manure		..		..		..		2	26	..		..		..		..	
Percentage increase		..		..		..		12·2		..		..		..		..	

* Crop damaged by wind-storms, and total yield could not be recovered by harvester.

In six districts the manured crops were so badly damaged that the results are of no value for comparative purposes, but in every case the unmanured crop stood satisfactorily. The heavier the crop, it was observed, the more disastrous was the effect of the storms.

In every instance where the crops were not damaged, there was an increase as the result of manuring, 56 lb. per acre giving an increase of over 5 bushels at Balldale, Murrumburrah, Berrigan, Milbrulong and Beckom, while at the last-named centre a 10-bushel increase was obtained as the result of an application of 70 lb. per acre on land cropped for the first time.

On the previous year's experience, 56 lb. per acre gave on the average the most profitable increase, and taking this as a standard, the average increase on all plots resulting from an application of 56 lb. per acre was 2 bushels 26 lb. or 12·2 per cent.; omitting the centres where the plots were badly damaged, the average increase was 21·6 per cent. This last figure still includes some crops that had received slight damage. In the previous four years the average increase as the result of an application of 56 lb. ranged from 24 to 25 per cent., and had it not been for the occurrence of the storms this season it is fair to assume that this figure would have been again reached.

An application of 56 lb. per acre of Wellington rock phosphate failed to give satisfactory results in comparison with an application of a similar quantity of superphosphate.

Crop-harrowing Tests.

To determine whether the practice of harrowing a growing crop is beneficial, two plots of Federation were sown under exactly similar conditions, and one crop was harrowed and the other left untouched. The test was made in three localities.

TABLE X.—Crop-harrowing Tests.

Locality.	Variety.	Yield per Acre.	
		Crop Harrowed.	Crop not Harrowed.
		bus. lb.	bus. lb.
Deniliquin	Federation	35 53	35 15
Berrigan	,, ...	29 57	26 37
Young	,, ...	21 34*	22 50*

* Crop damaged by wind-storms, and total yield could not be recovered by harvester.

It was intended to conduct the test also at Grong Grong, but an opportunity did not present itself when the land was in a fit state for harrowing, owing to the soil being continually saturated during the late winter and early spring months. For a similar reason difficulty was experienced in the other districts in carrying out the test, but advantage was taken of the spell from wet conditions, when the land was sufficiently firm to carry the team. Under these conditions it is remarkable that the harrowing should show any advantage, yet increased yields were obtained at Deniliquin and Berrigan. In the latter district an increase of over three bushels was obtained as the result of harrowing the crop, and the only explanation is that the land was so waterlogged during the winter that it had become depleted of air, and the benefit of harrowing lay in the effective ventilation of the soil.

Soil-liming Experiments.

Experiments to test the influence on the wheat yield of applications of lime to the soil were conducted at Nubba and Henty, plots being limed at the rate of 10 cwt. and 20 cwt. per acre, and one plot being left unlimed.

At Nubba, land that had been in cultivation for at least twenty-six years was devoted to the experiment, the lime having been applied to the fallow in 1914. Experiments were conducted on the area in 1915, when the application of 10 cwt. resulted in a decrease, while 20 cwt. returned an increase of 12½ per cent. It was decided to repeat the experiment without further application of lime, and the land was ploughed 5 inches deep during the first week in March, 1916, spring-toothed the last week in April, and drilled at the rate of 60 lb. seed per acre on 11th May.

At Henty the experiments were sown on second-crop land, which was fallowed in October, 1915, and received similar cultivation as for the other experiments conducted at this centre, the lime being applied in March, 1916.

The crops in both localities suffered from excessive moisture and stooled very sparsely ; they were also slightly affected with rust.

TABLE XI.—Liming Experiments.

Locality.	Variety.	Yield per Acre.		
		No Lime.	10 cwt. Lime per Acre.	20 cwt. Lime per Acre.
		bus. lb.	bus. lb.	bus. lb.
Nubba	Federation	14 27	14 29	17 0
Henty	,, ...	14 14	14 47	14 47

At Nubba no benefit was derived from an application of 10 cwt. of lime, but 20 cwt. gave an increase of 17½ per cent., being the second crop since the application of the lime. The lime applications were successful in checking the growth of sorrel.

At Henty a half-bushel increase resulted from both applications, which cannot be regarded as satisfactory.

Oats Trials.

Trials of oats were carried out at Henty, Young and Cunningham, the plots being sown in May at the rate of 40 lb. per acre. The land had been fallowed in each instance and received the same cultivation as for the wheat experiments at these centres.

TABLE XII.—Showing results of Oat Variety Trials.

Locality.	Algerian.	Brown Calcutta.	Lachlan.‡	Guyra.	Sunrise.	Ruakura.	Red Rust-proof.
			(*a*) Grain Yields.				
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Henty . ..	34 8	28 26	21 30	23 12	22 18*	18 4*	16 32*
Young .. .	†	....	30 9*	28 28*		25 0*	....
			(*b*) Hay Yields.				
	t. c. q. lb.		t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	
Cunningham ..	2 6 3 17	....	2 19 3 15	3 2 1 1	2 3 0 11	2 15 0 14	....

* Crop damaged by wind-storms, and total yield could not be recovered by harvester.
† Crop could not be satisfactorily harvested.
‡ Lachlan was formerly known as Cowra No. 18.

At Henty the crops were retarded by the superabundance of moisture, and they also suffered damage by winds. At Young a very heavy growth was made, Sunrise attaining a height of 7 feet 3 inches, while the other varieties were over 6 feet high and promised bumper yields. Unfortunately the crops were laid flat by wind-storms, and only a fraction of the yields could be recovered.

At Cunningham the crops lodged while in the hay stage and were cut for hay, the yields of which are given. Owing to the considerable damage done satisfactory comparisons cannot be made.

Grasses, Lucernes and Clovers at Glen Innes Experiment Farm.

G. G. C. St. POTTS, H.D.A., H.D.D., Experimentalist.

THE following information will enable readers to distinguish some of the grasses, lucernes and clovers at present growing on this farm. It must be clearly understood, however, that these notes apply only to New England (Tableland) conditions, where long, cold winters prevail, and where it is necessary to grow varieties which withstand severe tests of frost and cold weather.

Toowoomba Canary Grass (*Phalaris bulbosa*).

Phalaris bulbosa comes from the Mediterannean regions of Europe, having been imported from America to the Toowoomba Experiment Farm, Queensland, and having gradually spread into New South Wales, where it has now become acclimatised.

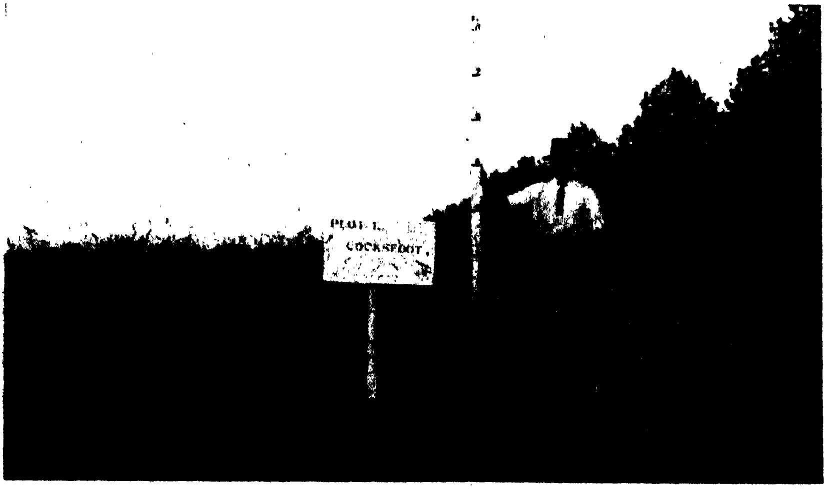
Toowoomba Canary Grass (*Phalaris buluosa*).

For a number of years it has given good results at this farm. It is a strong stooler, producing broad, succulent leaves of a bright green colour, and withstanding frost and cold conditions excellently. The root, which penetrates the soil to a considerable depth, is perennial. It has numerous long fibrous rootlets, covered with short silky hairs, giving them a woolly appearance. In the mature plant the seed stalks are a little taller than the leaves, having a cylindrical ear, averaging 3 to 4 inches in length, which turns white in colour when ripe.

During the dry spring and summer of 1915 this grass made good growth and withstood the adverse conditions admirably. It was noticed that sheep were continuously grazing on a block of *Phalaris bulbosa*, having left other introduced grasses in its favour. It had formed a close mat, providing excellent fodder for sheep. Undoubtedly this grass has come to stay on the Tablelands, as it carries green fodder throughout the winter months, when many other grasses have been cut back by frost. It is a grass which becomes established quickly, germinating readily from seed. If allowed to grow it attains a height of 5 to 7 feet, and if kept well stocked it provides succulent fodder for either cattle or sheep.

Cocksfoot (*Dactylis glomerata*).

This grass originally came from America, where it is known as Orchard grass, because of its tendency to grow in the shade of trees.



Cocksfoot (*Dactylis glomerata*).

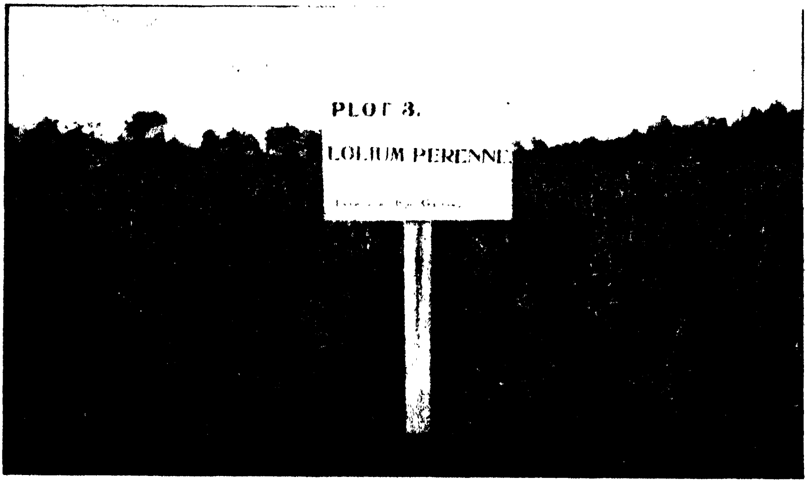
It is a perennial with an erect stem, growing 1 to 2 feet in height, with flowers in clusters. The leaves are dark green in colour, of medium width, and have a drooping habit. The root system is dense, with comparatively deep fibrous roots, 8 to 10 inches long. Cocksfoot is a useful winter grass, being a good frost-resister, and throughout the dry summer of 1915 it grew fairly well. It has a tussocky habit and it does not spread quickly, but the rapidity of its growth in the early stages is marked. It makes a good stand soon after sowing under fair conditions.

For a number of years good results have been obtained from cocksfoot. It is relished by stock, and produces a large amount of succulent fodder, with a good percentage of green aftermath.

Perennial Rye Grass (*Lolium perenne*).

This grass was originally introduced from England. As its name indicates, it is a perennial, producing a fair amount of tender, succulent foliage.

The leaves are dark green in colour, narrow, glossy in appearance, very soft, and with a drooping habit. The flower stem, which is upright, grows to a height of 18 inches, having the seed set in rows on a panicle about 6 to 8 inches in length. The root system is comparatively shallow, with dense fibrous roots, slightly creeping underground. From seed this grass germinates readily, makes rapid early growth, and makes a good stand.



Perennial Rye Grass.

It withstands frost and cold wintry conditions well, but goes off considerably during dry weather. However, it responds readily to rain and grows quickly. For a number of years perennial rye grass has stood stocking well and given good results in the field on this farm, making in the spring a rapid growth that is very succulent and extremely palatable, and that is relished by stock.

In order to increase its permanency, it should be allowed to seed every three or four years.

Hungarian Brome Grass (*Bromus inermis*).

This grass is a native of the dry regions of Europe and Western Asia. Some few years ago the results obtained at this Farm were good, but of late its growth has been very disappointing.

It has a deep fibrous root system with underground creeping roots. In time it forms a thick mat under the surface, and eventually chokes itself out. The leaves are soft and succulent and dark, dull green in colour, and drooping. The seed or flowering stalks grow to a height of 3 feet in good seasons, and produce a fair amount of seed on spreading panicles.

Germination from seed is very erratic, and the early growth is slow, its habit being to grow in medium-sized clumps. When once established, however, it produces a fair amount of succulent fodder, which is relished by stock. It has the reputation of being a good drought-resister, but during the dry summer of 1915, a large percentage of the plants died out. As a frost-resister it is only medium, and at present the prospects of it proving permanently useful at Glen Innes are not very good.

It was noticed in the last planting that a comparatively large percentage of plants of *Bromus mollis* (soft Brome grass) was present. This variety should be eliminated, as it is only an annual, producing a small amount of foliage, dull green in colour, and covered with numerous small hairs which give it a greyish appearance. It dies off as soon as the hot weather comes, but previous to that it seeds freely, and is therefore doubly undesirable.

Tall Oat Grass (*Avena elatior*).

This grass is perennial in habit, has a deep fibrous root system, and grows in tussocks.

Throughout the winter months it grows steadily and withstands severe frosts and cold weather. The leaves are dark green in colour, upright and succulent. The flowering stems grow to a height of 4 feet 6 inches, having the seed set on spreading, tree-like panicles from which the seed shells easily, and turns white on ripening.

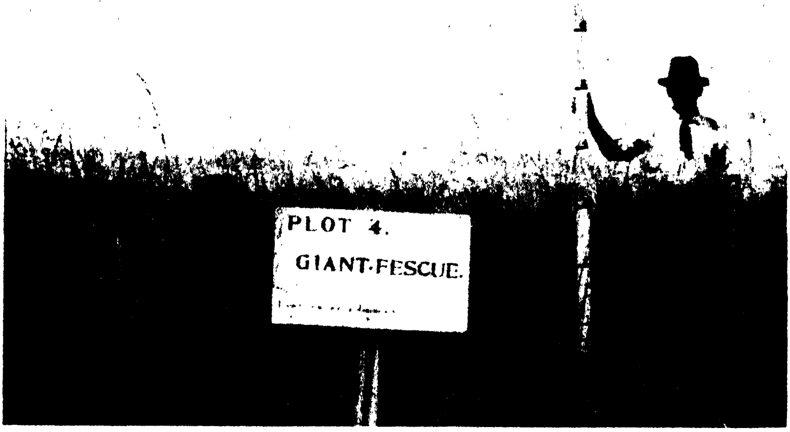
Tall Oat Grass.

The seed germinates readily and makes quick growth in the spring, but owing to the tussocky habit of the grass it is advisable to sow in a mixture. No field trials have yet been carried out with this grass, but in the selection plots it gives great promise, not only withstanding cold weather admirably but also resisting droughty conditions, as was clearly indicated during the dry spring and summer of 1915, when it was not affected in any way.

Giant or Tall Fescue (*Festuca arundinacea*).

Giant Fescue has only been given a limited trial in the selection plots, but it appears to be of good promise.

The germination from seed is slow and the percentage only medium. Its habit is to grow in tufts, with a medium to deep root system, and only slightly creeping underground roots. The leaves are pointed and upright, bright or emerald green in colour, and broad, with a glossy appearance. The flower stems reach a height of 4 feet, and produce seed abundantly on spreading panicles having a dark brown colour.



Giant or Tall Fescue (*Festuca arundinacea*).

Although a slow grower in the winter, Giant Fescue withstands frost and cold weather very well, and makes quick growth in the spring, stooling well and producing succulent fodder suitable for cattle. Throughout the dry summer of 1915 it grew well, showing its ability to resist drought. This grass has a reputation of becoming ergotised, but up to the present no sign of ergot has been noticed.

Prairie Grass (*Bromus unioloides*).

Prairie grass is a native of Western Asia. It can be noticed in pastures over the greater part of this State. Under New England conditions it thrives well, being a good frost-resister, and making good growth in the spring and autumn.

It runs into seed early in the spring, and produces a fair amount of succulent fodder which is relished by stock in the early stages of growth. Under ordinary grazing conditions it is an annual, but if cut or protected it develops the perennial habit. It is an erect grass, medium green in colour, leaves slightly hairy and drooping, with panicles of a spreading type, producing a large amount of seed which germinates freely. It grows in clumps, and stools very well. This grass would be one of the best, except for the fact that it will not stand stocking to any degree, and if used it should be sown in mixtures.

Kentucky Blue Grass (*Poa pratensis*).

Although not producing leaves or stems of a great height, this grass grows well and spreads over the ground quickly.

It is a perennial, having its root system confined to within a few inches of the surface. It spreads quickly, and makes a good stand owing to its creeping root stocks. The leaves are smooth, of a dark green colour, short but succulent.

Kentucky Blue grass withstands frost and cold weather well, and when once established stands stocking very well. It is a very suitable sheep grass, and although it has the reputation of not standing dry conditions, it did not show any signs of going backward in the dry weather of 1915. Owing to its creeping habit and short growth, this grass should prove excellent for lawns in New England.

Hooker's Fescue (*Schedonorus Hookerianus*).

This native grass, although not very common in the pastures, has shown up well in the grass garden.

It is essentially a cattle grass, producing large, broad, medium coarse leaves of an emerald bright green colour. It is a perennial, having a deep, vigorous, fibrous root system, and mainly on this account it withstands dry weather very well. It stands frost and cold conditions admirably, and on being cut produces a fine after-growth. This grass grows in unsightly clumps, producing flower stems 4 to 4½ feet high, having branching panicles, of a brown colour, on which is set a fair amount of seed.

Wallaby Grass (*Danthonia semiannularis*).

Spreading through the pastures, this native grass is becoming very popular, and rightly so, too. It is a perennial tufted grass, producing a fair amount of succulent soft fodder, suitable for either sheep or cattle.

The leaves are narrow, usually hairy, and light green in colour. The flower stems grow to a height of 2 feet to 2 feet 6 inches, and the seed, which sheds easily, is produced in clusters that have a woolly white appearance when ripe. Wallaby grass provides good feed during the spring and summer and remains green in the winter months.

Lucernes.

Although this district is not considered suitable for lucerne-growing on a large scale, owing to the long winters, the results obtained on this farm show that very fair yields can be produced if the right varieties are grown.

When sowing such varieties of lucerne as Montana, Algerian, and others that stool strongly, it is advisable to sow in drills about 16 inches apart. This allows of cultivation between the drills, which is helpful to the growth of the young plants, and enables them to stool out more readily. Under these conditions autumn sowing is advised, as that allows the plants to develop a good root system during the winter months.

Tamworth Lucerne.—This variety stands cold conditions very well, but stools scantily and produces only a fair amount of fodder. The growth is upright, with leaves of a medium dark colour, the branches are leafy, and the stems inclined to be woody. The root system is strong, with a deep tap-root. Up to the present this lucerne has not proved to be as good here as other varieties on trial.

Algerian.—This lucerne has given very good results for the past ten years, and continues to produce very good crops in the field. It is an excellent frost-resister, stools strongly, and grows very quickly in the spring, producing dense, dark green, succulent foliage, that is relished by stock. The leaves are not as broad as those of Tamworth, but the yields are more consistent.

Montana.—This, a strong rival to Algerian, was imported from America, and is giving excellent results. For some years it was tried in the grass garden, where it stood the cold wintry conditions very well. Two years ago it was given a trial in the field, and again good results followed. An area of 1¾ acres was sown in May, 1915. The germination was excellent, and throughout the winter, although the growth was slow, it withstood very severe frosts and cold weather. The spring and summer of 1915 were very dry, but this lucerne stood the test well, and two medium cuts were obtained. This year a cut was obtained yielding 2 ton 4 cwt. of hay per acre, and one month from the date of cutting it had grown to a height of 18 inches.

It is a good strong stooler, producing more bulk than Tamworth, and the stems are not so coarse.

The tap-root is large, and the root system throughout very deep and dense. The foregoing results speak for themselves, and seem to show that Montana is suited to these conditions.

Northern Californian was imported from America, and has grown fairly well. It is a medium stooler, and withstands frost and dry conditions well, but it has not yet shown sufficient promise to be extended to the field areas.

Peruvian.—Is characterised by a dull grey appearance, due to the hairiness of the leaves. This lucerne has given only fair results. It is a medium stooler with short stems, producing a comparatively small amount of foliage. It withstands frost and cold conditions well, and will be given further trial.

Sand.—This variety assumes a very prostrate habit of growth, and produces a large amount of foliage at the crown of the plant. Owing to its procumbent habit, it is only suitable for grazing. It stools strongly, and withstands cold conditions very well. Throughout the dry summer of 1915 it grew comparatively well.

Arabian.—Is a very weak stooler, producing a small amount of foliage. The leaves are hairy, as in the case of Peruvian, but much larger, and the stems are coarse but succulent. This lucerne was continually cut back by frost, and on this account alone cannot be recommended for these conditions.

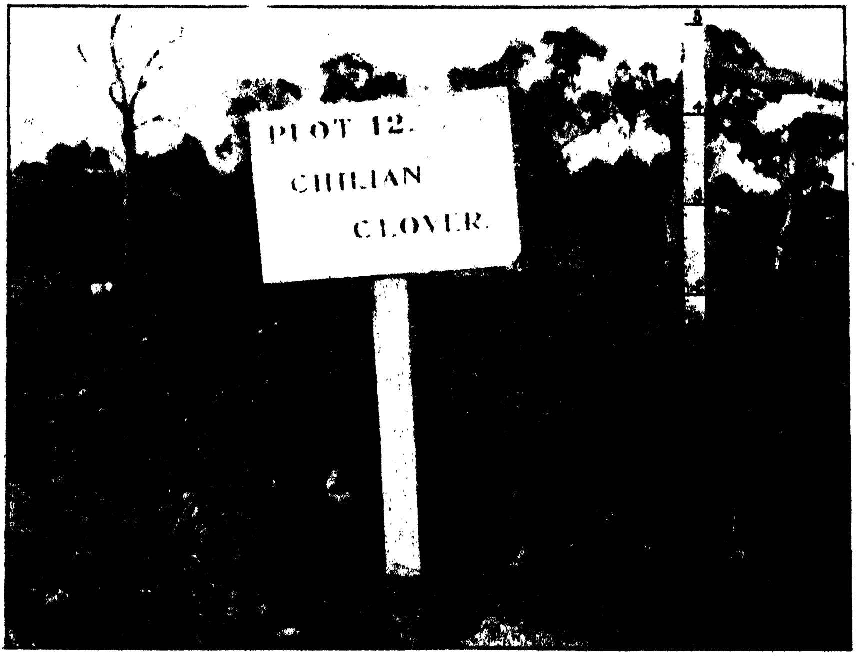
Oasis.—Has a somewhat similar habit to Sand, but has not shown any growth worthy of note. Up to the present the results have been disappointing, but further trial will be given.

Turkestan.—Is a medium stooler, producing thick leafy growth, with rather small leaves and medium stems. It stands cold conditions fairly well, but does not show very great promise.

The foregoing notes indicate that up to the present time Montana and Algerian lucerne are showing the greatest promise for New England conditions.

Clovers.

Chilian Clover (*Trifolium pratense perenne*).—This clover is a perennial variety, producing a large amount of succulent fodder. It is a strong stooler, possessing a good root system, a strong tap-root 6 to 8 inches long, with few fibrous roots, and a large percentage of the root nodules that indicate the presence of nitric acid-fixing bacteria. The leaves are broad, light green, and the flowers are large and heliotrope in colour.



Chilian Clover (*Trifolium pratense perenne*).

This clover is an excellent winter grower, and should prove useful for pastures, hay, or rotations, as it grows to a height of 2 to 2½ feet. From seed it germinates well, and in a short time produces feed which is relished by stock. In the field trials it produced 4½ tons per acre for one cut.

Perennial Red Clover (*Trifolium pratense*).—This clover (which germinates readily from seed) is very similar to Chilian. It produces a large amount of dark green foliage, and stools profusely. The leaves are dark green in colour, broad and succulent. The root system is deep, with strong tap-root 9 to 10 inches long, and few fibrous roots. The flower is large and heliotrope in colour. For some years it has been used in the rotations with success, standing both cold and dry conditions very well. Owing to its height, 2 feet to 2 feet 6 inches, it could be safely used as a hay crop.

Alsike (*Trifolium hybridum*).—This variety is a perennial, producing a fair amount of dark green foliage. Throughout the winter months the growth is slow, but it comes on quickly in the spring. Its growth is of a slightly creeping nature. The flower is small, and pinkish white in colour. The root system is comparatively shallow, but with a strong tap 3 to 4 inches long, with many fibrous spreading roots. Throughout the dry conditions of 1915, this clover survived better than any of the other clovers on the light soils. Although it shows promise, this clover cannot be compared with Chilian or Perennial Red for these conditions.

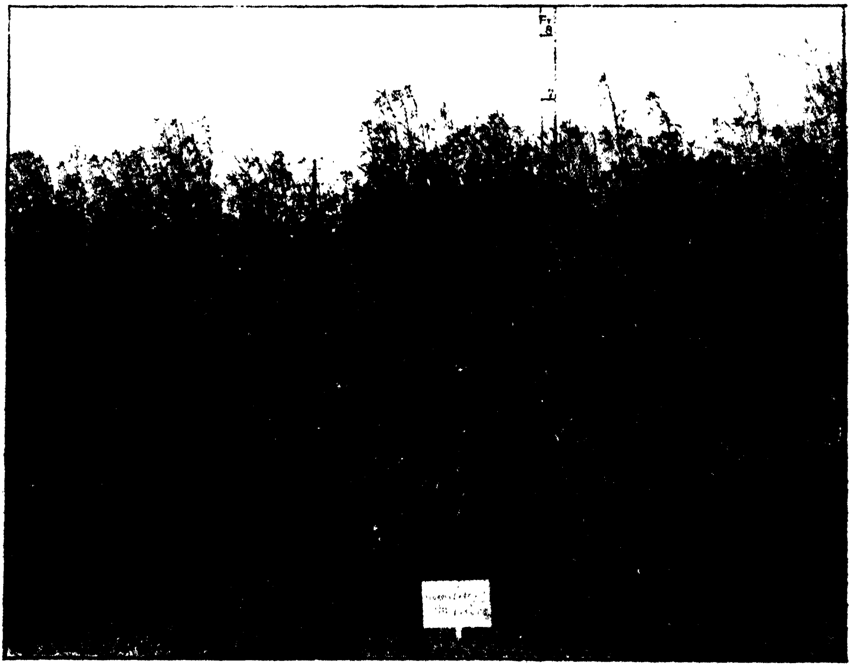
Ladino.—This clover was introduced from America and has only had a limited trial. It produces a fair amount of succulent foliage, dark green in colour, with only medium-sized leaves. The growth during the winter months is slow, but it stands frost very well and comes on quickly in the spring. It grows to a height of 1 foot, and has a tendency to creep, sending out roots at the nodes of the stems, which are numerous The stems are comparatively fine and succulent. The root system is shallow, the tap root being 3 inches long, with numerous fibrous roots near the surface. Germination from seed is very fair. The drought-resisting qualities of this clover are not known, as this season has been a very wet one.

Crimson (*Trifolium incarnatum*).—This clover, the seed of which germinates fairly well, is an annual, producing a fair amount of light green foliage, which comes on early in the spring. It grows very little during the winter months, but stands frost and cold conditions well. It is a medium to sparse stooler, growing 1 foot in height and having flower heads which give it a very attractive appearance, scarlet or crimson in colour, about 1½ to 2 inches long. The root system is good, having a fairly strong tap-root, 4½ inches long. This clover, owing to the quickness of its growth, should prove useful for rotation purposes.

Strawberry Clover (*Trifolium fragiferum*).—This clover has a creeping habit, with fine hairy stems which send out roots at the nodes. The leaves are very small and a light dull green in colour. The growth is extremely slow, and in one year the plants only grew 1 inch to 1½ inches high. It flowers very scantily, the blooms being of a flesh colour or pale pinkish white and very small. This clover contains a large percentage of hard seeds, which, owing to the nature of their skins, will not absorb enough moisture for germination. Very fair results have been obtained by rubbing the seed gently with a small piece of brick, the object being to hull and scratch the seed without crushing it. It is not suitable for pastures, but it has a reputation of growing well in swampy conditions.

Bokhara (*Melilotus alba.*)—This variety, which is commonly known as American Sweet or White Clover, is a biennial showing great promise.

Throughout the winter months during the first year it withstands frost and cold weather well, but the growth is practically at a standstill. Early in the spring it grows very profusely. The true Bokhara, if sown in the spring, does not flower the first season, but in the second year it seeds very freely, producing a white flower, small, arranged in rows along panicles 3½ to 4 inches long. In the second season this clover is cut back to the ground by frost, but it comes away quickly in the spring, yielding a large quantity of dark green succulent fodder, with very leafy growth.



Bokhara Clover (*Melilotus alba*).

The stems, however, become very woody during the flowering stages, and in this state it is unsuitable for hay. It is a very strong, profuse stooler, and spreads over the ground until near flowering time, when it grows upright to a height reaching 7 to 8 feet. It possesses a strong root system, with the tap-root penetrating 5 to 6 feet deep in the heavy black basaltic soils. This clover has a peculiar smell and a bitter after-taste to which stock do not take readily. It is understood, however, that once stock acquire the taste they eat it greedily, and fatten very quickly on it. Owing to the rapidity of its growth, it should prove an excellent crop for rotations, in order to increase the store of humus in the soil, and at the same time to increase the store of nitrates in the soil by means of the colonies of bacteria in the root-nodules, which, according to American authorities, are similar to those found on the roots of lucerne. This clover has become very popular in America for grazing, hay and rotation purposes. The question of growing this clover for the sake of its flow of honey might also receive serious attention; it was noticed that the bees were very plentiful where it was growing.

Conclusion.

In conclusion, the importance of growing winter grasses for the Tablelands must be quite obvious where severe frosts and cold weather prevail. Introduced or cultivated grasses will no doubt play an important part in the raising of sheep in this district. In former experiments on this farm it was clearly demonstrated that sheep resisted the attacks of worms very well on introduced grasses, and also put on much more weight in the same time. The native grasses, as a whole, die down in the winter, and if stock are to be raised on sound business-like lines the question of laying down introduced pastures must receive serious consideration.

UTILISING THE WATER HYACINTH FOR COMMERCIAL PURPOSES.

As supplementing the information furnished by the Commercial Commissioner for New South Wales in the East and published in the issue for November, 1916, Mr. J. B. Suttor now writes that the Director of Agricultural and Commercial Services of Cochin China, in reply to a request for information, states :—

> The experiments made some years ago to produce rope from the "Luc Binh" were not at all encouraging, as it was found that the fibre possessed no resistance. It was further discovered that the fibre rotted and deteriorated very rapidly when exposed to the inclemencies of the weather. It was thus found impossible to make useful ropes out of it. The only practicable use to which up to the present it has been found possible to put the "Luc Binh" has been to convert it into a manure or fertiliser by allowing it to decompose in heaps on the banks and subsequently to spread it over the fields. It has been found that the residue of these heaps is a mould rich in potash and azote (nitrates?).

Mr. Suttor also reports that many attempts have been made to use the plant in other ways in Cochin China, and especially in the gaol workshops. An experiment was made to use it for wicker chairs, but it was found unsuitable. It was also converted into bags and mats. These after a short time became mouldy, as though continually dried the fibre was found either to absorb or else to retain a large amount of humidity. Further, the bags were found to be more expensive in production than gunny-bags, besides being some two or three times heavier. This experiment was consequently found to be commercially impossible.

It would therefore appear that M. Perrot's report as to the prospect of utilising the plant profitably, as published in the November issue, was somewhat optimistic, and has not been borne out by subsequent experience.

Poultry Notes.

APRIL.

JAMES HADLINGTON, Poultry Expert.

THE time is again approaching when active preparations should be made for the breeding season. Poultry-farmers are now within a couple of months of the time when the first eggs should be set down. Therefore, a start should be made to get the breeding pens made up. Many hens may not be quite through the moult, but that fact need not prevent them being got together in the pens where they are to be located for the season. It is not absolutely necessary to put in the male birds so early. These may be added at a later stage, but it is advisable to have them in a full month before eggs are required for incubation. This should not be taken to mean that male birds must necessarily be in the pens for that time before the eggs are fertile; many are often so from the fourth day, and generally the maximum fertility of the pen is reached by the ninth day; but there are other considerations why the pens are better mated earlier.

Conditions of Mating.

Many poultry-keepers mate only second-year hens to breed from, and while there is much to be said in favour of hens in the second year as breeders, the fact that they lay fewer eggs early in the season than are obtained from pullets is a factor to be reckoned with. Trusting to hens in their second and third year very often results in disappointment in the number of early chickens obtained from them. It is much preferable to have early chickens hatched from well-matured pullets than late chickens hatched from older hens. But no pullet should be bred from unless she is well grown and mature. As an indication of what is regarded as good development it might be stated that 4 to 4½ lb. would be fair weight for, say, a Leghorn female, and 5 to 6 lb. for males of the same breed, while 2 lb. heavier is desirable in the heavier breeds. All should possess indications of strength and vigour.

Age and weight are most important factors in selection of breeding stock. Breeding from immature, undersized, badly-reared stock, together with too intensive methods of keeping them, is responsible for much of the so-called bad luck in hatching and rearing, and the sooner poultry-farmers come to realise the truth of this, the better chance they will have of success in this direction, and now is the time to think of this.

New Stock.

No time should be lost now in making arrangements for any new stock it may be intended to introduce. It might be well here to warn beginners against too close breeding, and rather than run risk in this respect to introduce new blood. Inbreeding and line breeding have their legitimate place in the scientific breeding of poultry as well as animals; but this is no work for the novice who is unable to select his specimens. The idea of basing such work on egg production alone is having a most pernicious effect, and is ruining many flocks. Type and physique must be insisted upon in breeding stock.

A Problem in Feeding.

A good deal of concern is being manifested by poultry-keepers in regard to the class of pollard now available, as well as in some instances the difficulty of procuring adequate supplies as compared with bran. It is complained that not only is the pollard coarse, and in some cases inferior, but more than the orthodox amount of bran has to be used on account of the scarcity of pollard.

Poultry-keepers for the most part labour under the impression that coarse pollard is much inferior to fine pollard in the matter of food value. It may be said at once that this is a fallacy. The difference between fine and coarse pollard is in the amount of flour taken out of it; but it should be understood that flour is actually of less food value to the poultry-farmer than coarse pollard. It is just as well that this matter be clearly understood, because apart from some temporary conditions now prevailing, there is little doubt but that there will be an increasing tendency in the direction of coarse pollard, for the simple reason that up-to-date milling machinery is capable of eliminating more flour from the pollard than is possible with the old class of mills. But no alarm need be felt on that account in regard to food values.

The main difficulty, however, in regard to either one or the other of these foods, is from a point of view of making a mash of good mechanical consistency, *i.e.*, a mash that will adhere so that it can be fed with the least amount of waste. This is the real difficulty in regard to fine or coarse pollard or bran. To overcome this it may be necessary to use some substance that will bind this coarse material into the proper consistency. In this connection two suggestions may be of service. The first is that linseed oil-cake might be used in proportion of 10 to 15 per cent. If this product is scalded it will form a gelatinous mass that will, when mixed with coarse pollard, make it very much more binding and help to bring the mash to the required consistency for feeding. The only trouble to be met with here is that of palatability; scalded linseed having a repugnant odour it will be necessary to accustom the hens to it gradually, otherwise they will eat less food and the egg yield will suffer accordingly.

The next suggestion is that a low grade flour might be used in the manner described below, as was advised during the feed crisis of a couple of years ago. At this time, as the result of some inquiry in regard to mixing flour and bran in the absence of pollard for the morning mash, an experiment was carried out to determine what quantity of flour would be required to mix with bran to make it of a fair mechanical consistency, and of much the feed value as in the case of using pollard. Several proportions were tried and in different ways. It was found that by using flour in its raw state, quite 40 per cent was required to "bind" the bran, but by boiling the flour, and making it into what may be described as "billstickers' paste" made into a thin state, a much smaller quantity was necessary. That is to say, by gelatinising the flour about 15 per cent. is required to achieve the same result, much depending upon the class of flour. The food value of the resulting compound would be much the same as that of the usual mixture of pollard and bran.

It is not contended that this mixture will meet the requirements of poultry-keepers with the same facility as when using the medium to fine class of pollard, but we have to face conditions as we find them. The duck-farmer will be the greatest sufferer from coarse pollard, because of the tendency for a large proportion of it to pass through the duck undigested.

LINSEED GROWING.

So far linseed has not been grown in this State on an extensive scale, and that grown has been for purpose of experiment only.

Last season a crop was sown on the Yanco Experiment Farm and yielded only about 14 bushels of seed per acre. This does not pay in comparison with other crops which can be grown on this area. If, however, the straw could be utilised as well as the seed, there would be more inducement to plant this crop

The Irrigation Area is certainly the most promising district in the State for linseed cultivation, on account of a regular supply of water being assured.

The most suitable soil for growing linseed is that of a rather loamy description.

The seed should be sown in the autumn, say, any time during April or early part of May. The amount of seed to be sown is from 30 lb. to 40 lb. per acre, and to this area should be applied with the seed about 60 lb. of superphosphate.

The seed can be sown with the ordinary wheat drill, and should be sown through every cup.

The land should be ploughed and cultivated in the same manner as for a wheat crop.

The crop ripens about November, but it is advisable to cut it with reaper and binder a few days before it is thoroughly ripe, and it has subsequently to be threshed.

There are no mills in this State where the fibre can be treated.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Cattai.

A meeting was held on 1st March, at which fifteen members were attendance.

A letter was received from the St. Ives branch asking for co-operation in a protest against the importation of citrus fruits from countries in which citrus canker is known to occur. After discussion it was decided to inquire into the matter before taking action.

It was decided that the Cattai branch should be represented at the forthcoming Hawkesbury District show, and a committee was appointed to draw up a scheme.

Coradgery.

The monthly meeting was held at the residence of Mr. Walter Brown, Estcourt, on 3rd February. Mr. W. E. Tayler, Adavale, was in the chair.

The second issue of the manuscript journal was distributed, and it was decided to forward the surplus issues to Secretaries of other branches. Members were delighted with the production, and the editor, Mr. Kelk, was heartily congratulated upon it.

On the proposition of the Chairman, seconded by Mr. Clatworthy, the following resolution was unanimously carried :—" That the members of this branch strongly urge the Government to immediately guarantee farmers at least 4s. per bushel cash, at railway station, for next year's wheat; otherwise there will be a serious shortage in the area sown."

A proposal was brought forward by the Chairman, at the request of a lady in the district, to initiate a " Free Gift to England," namely, that members and all farmers of the district who are willing should give the product of wheat from one or more acres of their next year's crop. It was thought if the idea met with the approval of farmers throughout the State, a large shipment of wheat would be obtained, which would be a most acceptable gift to the Mother Country, and would also be the means of expressing the loyalty of the New South Wales farmers.

The matter was discussed and support promised, and it was then postponed for further consideration at next meeting.

The members were hospitably entertained at afternoon tea by the ladies of Estcourt.

The following harvest reports were read :—

HARVEST REPORTS.

Mr. W. E. Tayler, Adavale, wrote :—I suppose it is safe to say that the 1916–17 harvest has been about the most disappointing in the history of farming in this district. As regards Adavale, where, when the crop was ripening, I expected to reap 6,000 bags, I have succeeded in getting about half of that amount, and a considerable proportion of that light and inferior. It is rather superfluous to mention the causes, we all know them so well, viz., excessive rain, wind and rust. It has been impossible to keep any accurate records of what different varieties yielded, as it has been a case of stripping patches here and there, wherever it was thought most wheat could be got. But a comparison as to how much the different varieties were affected by the above-mentioned ravages should be of some interest. Of Firbank, 80 acres drilled, on disced stubble land, early in April, without manure, promised to be a good hay crop, but owing to the continuous rains it ripened before the machines could get on to the ground. Most of it is there yet, for it is impossible to do anything with it owing to the growth of thistles and rubbish. The little I managed to strip yielded an excellent sample, apparently quite unaffected by rust. In the same paddock, sown as above in April, Yandilla King promised an easy six to eight bags, but it rusted badly and gave a return of three to four bags of pinched wheat, weighing 53 to 56 lb. Yandilla King sown in the adjoining paddock on similar soil, fallowed immediately after the above, with 40 lb. of superphosphate, made an abnormal growth, and in spite of 25 per cent. being flat on the ground, yielded a magnificent sample, weighing 61 to 63 lb. and somewhere in the vicinity of seven bags. Rust showed distinctly on the stem, but did not affect the grain. The question arises why not, when the other paddock was practically ruined? Personally, I can only put it down to the fallowing and manuring causing the growth to continue normally, in spite of the rust. Rymer and Marshall's No. 3 in the same paddock turned out practically as well, all weighing 61 to 63 lb. Bomen in the same paddock, fallowed and manured, was the best crop I had. There was the same abnormal growth, with fully 25 per cent. lodged; yield eight bags of a splendid sample, weighing 64 lb. Easily another four bags, if not more, was left on the ground. Federation under the same conditions, as to manure and fallow, looked at haymaking time a 12-bag crop, but returned three to four bags of a wretched sample, weighing about 50 lb. This crop was immediately adjoining the Bomen and all the conditions were identical.

Mr. W. Brown, Estcourt, wrote :—No. 1 paddock, 110 acres, sown with Yandilla King and Steinwedel. Steinwedel, 30 acres, cut for hay; Yandilla King, 80 acres, sown late in March, with 30 lb. seed to the acre; eaten bare in May; crop on the heavy ground lodged badly and damaged very much by storms; yield 293 bags; 60 lb. to bushel; affected with rust, but not badly, though a bit cut for hay was very light. Rain from the time of sowing to December, 2,260 points. No. 2 paddock, 90 acres, sown late in April and early in May; 10 acres with Bunyip, 60 lb. seed to the acre. The paddock being low-lying, most of the wheat was drowned; what survived was damaged by storm; yield 16 bags, sample very good. The 80 acres sown with Federation was ruined with rust; yield 113 bags, sample very inferior, under 50 lb. to the bushel. No. 3 paddock, 40 acres, sown with 40 lb. Steinwedel to the acre in May; damaged very much by storm and overgrown with cockspur; stripped 30 acres for 70 bags: sample, 58 lb. to the bushel.

Cordeaux-Goondarin.

A meeting was held on 7th February, at which Mr. A. E. Fishlock read an article on profitable apple culture.

Cotta Walla.

A meeting of this branch was held on 13th February, at which Mr. L. Barber read a paper on soils. He discussed the formation of various soils, and dealt with the different methods of cultivation and treatment.

French's Forest.

A meeting of this branch was held on 3rd March. The dates for this year's meetings were fixed, and Mr. Mitchell read a paper on potato-growing from which is taken the following:—

SOWING THE POTATO CROP.

Potatoes require a good, rich soil—the best spot on the farm. The ground should be ploughed 6 to 7 inches deep, and fallowed for six or eight weeks before planting. As to seed, small potatoes can be divided into two classes—(1) the late-formed tubers of strong, robust plants, and (2) the average tubers of plants of poor vitality. The former would yield as well as the parent plant, but the latter could only be expected to produce a crop of poor quality tubers. The safest way is to purchase large seed, and, after it has shot, cut it into sets so that there are two shoots on each set. The sets should be rubbed in wood ashes and exposed to the sun for one or two hours. Sets so prepared never bleed in dry ground. The sets should be sown 4 inches deep, 15 inches apart in the rows, and with the rows 3 feet apart. When planting the ground should not be too wet, and should be harrowed after sowing. As soon as the plants show through the ground, the hoe should be used to keep down weeds. Later on scarify and hill with the plough.

Glenorie.

A meeting was held on 2nd February, at which there was a good attendance of members.

The principal business was the report from the branch's delegates to a special meeting of the Fruit-growers' Association's executive. The report was a lengthy one, but it was felt that good had been done by the conference with the association, and the hope was expressed that some direct results would accrue in other years like the present.

Kellyville.

The usual monthly meeting of this branch was held on 3rd March, there being a good attendance of members. After the general business discussion took place on the branch's exhibit at the last Castle Hill Show, and a vote of thanks was passed to the Committee.

Mr. Garner read a paper on pigs, which was listened to with interest.

PORKERS AND BACONERS.

There are many different breeds of pigs and various breeders claim for their own particular variety some superior quality or advantage. The British Black is the largest pig grown in this country. Jet black in colour, with very large, drooping ears, and anything but good looking, these pigs are very prolific and very hardy. The suckers grow fast and are very good pigs if killed at about 70 lb. dressed weight as porkers. But if left for baconers they make a deal of waste, the head being large and the other parts not suitable for market proportionate. The meat is very coarse in the grain.

The Yorkshires are a white variety, divided into three sections known as large, medium and small. The Yorkshire is much finer in the skin than almost any other variety. The Large Yorkshire is a good breeder, the young are a satisfactory size when farrowed and grow well. These pigs are very suitable for either pork or bacon, and command a ready market; many people think they dress better than a black pig. My experience has been that there is no difference between black and white pigs in the hands of an experienced scalder. There are one or two drawbacks to white Yorkshires. The first is that the skin being thin and covered with white hair, they will not stand the heat in hot climates so well as a black pig, and are very liable to sun-scald, but if kept under cover with the roofs not too low they do very well. Another objection some butchers and bacon-curers have is that they make a lot of weight in the shoulders, while they are not as heavy in the hams as some other sorts. This variety is a short-faced pig, easily fed, with a tendency to run to too much fat.

The Tamworth is another of the large varieties. He has medium legs, is very deep in the body from the back to the belly, matures very quickly, is a good breeder, is covered with longish bristles, mostly of ginger colour, and has a long, thin head which tapers very much to the snout. For this feature he is out of favour with a lot ot pig-keepers, the common idea being that, because he has a long, lean, thin head and very sharp snout, he eats a deal more than a short-faced pig, but such is not borne out by facts. This pig is a quick grower, and is esteemed to be a good sort for pork, because there is little waste in the carcase. There are no jowls on the head, so that in proportion to the weight of carcase the head weighs less than any other variety. Looking from head to tail he is straight, having about the same weight or thickness from neck to ham. When killed for bacon, being deep in the body he makes wide sides of bacon that are of the description admired by Australians, having plenty of meat and not too much fat. The meat is finer in the grain than that of the British Black, but not so fine as the Yorkshire.

The best all-round pig, in my opinion, is the Berkshire. There is now on the market a pig called the Improved Berkshire, but to my mind he is not as good all round as the original Berkshire. Although he is a nice pig to look at, he does not stand as much hardship, and has some of the disadvantages of the Yorkshire. He has a short face, white feet, black body, thin skin, fine bristle, and small legs in comparison with the body. The fault I find with this pig is his tendency to get too fat. Otherwise he is an ideal pig. He is a good breeder and matures quickly.

Like many other animals, the pig is almost what we make him. In one person's charge he is a dirty, scraggy thing that hardly any one would care to associate with, while in the care of another he looks well, is clean, and does well. Half the pig is in the way his trough and quarters are looked after.

There is a pig in the United States of America known as the O.I.C. This is the largest pig in the world (as far as I know) when matured, which takes about 18 months or 2 years. When dressed he scales about 1,000 lb. The meat is coarse, but as this variety is grown for lard and canning, it is very profitable. When killed the fat is all taken off and the balance is packed for export.

There is no pig indigenous to the mainland of Australia, but there are, for all that, thousands of wild pigs. These are bred from pigs which have either escaped or have been turned loose years ago. They are a nondescript-looking lot, especially in a dry season. but improve quickly in a good season. If caught and penned up they are very good eating when young but not much as bacon.

Another good hardy pig is the Poland China, but for some reason or other he has gone out of fashion. At times he has been crossed with the Berkshire, producing a very good all round pig, hardy, a good doer, and a very quick grower. My experience of pigs is that there are fashions in connection with pigs as with poultry. Sometimes it is one or another pure breed or some cross which is fashionable, but these fancies last only for a while.

Some of the better crosses are the Tamworth-Berkshire cross, Berkshire-Yorkshire, Poland China-Yorkshire, and Poland China-Berkshire, but as I said before half the pig is in the feeding and attention.

Lankey's Creek, Jingellic.

A meeting was held on 10th February, when the secretary, Mr. G. J. Nichols, having enlisted for active service, tendered his resignation, which was received with regret.

Leech's Gully.

A meeting was held on 9th January. Mr. G. R. Smith exhibited five samples of wheat grown by him on small plots, the best samples being Marshall's No. 3 and Steinwedel.

Mr. J. Leech reported on the results of the experimental plots under the control of the branch.

Twenty-five varieties of wheat were planted on 3rd May, 1916, namely :—Firbank, Rymer, Huguenot, Zealand, Warren, Bunyip, Cleveland, Yandilla King, Marquis, Haynes' Blue-stem, Florence, Bomen, Steinwedel, Comeback, John Brown, Sunset, Currawa, Bobs, Hard Federation, Federation, King's Early, Nardoo, Marshall's No. 3, and Cedar. All varieties were sown with a seed drill in the same kind of soil, and during the early period of growth promised to be most instructive to farmers from both fodder and grain points of view. It was the intention of the branch to obtain samples of the grain and of the hay, but as the plots matured earlier than the grain on farms around they were literally eaten out by parrots as soon as the grain began to form. Mr. Leech managed to save a few samples of hay from a few of the varieties. From the knowledge gained, Zealand seemed to be the most profitable crop for hay. Firbank also was a good hay variety.

Rust spoilt the oat crops in almost every case. Twelve varieties were sown, and only three harvested—Algerian, Carter's Royal and Cape. The samples obtained were very much depreciated in quality.

An experiment in maize-growing is being carried out at present. The plots were planted on 4th October, in different ways, using Fairy Queen, Iowa Silvermine, Hickory King, American Wonder and Goldmine as varieties. The method of planting was four rows of each variety; the first row was planted with one grain every 18 inches, second row with one grain every 24 inches, the third with two grains every 3 feet, and the fourth row with two grains every 3 feet 6 inches. At the time of the meeting very little difference could be seen between the different varieties, but the experiment is to try to prove which method of planting gives the greatest yield.

Lower Portland.

A meeting of this branch was held on 5th February, when a paper was read by Mr. L. Green, of which the following is a condensation:—

SELECTING AND HANDLING DAIRY COWS.

The most important factor in dairying is selecting the cows. A great deal of attention must be given to the type of cow that will prove the best producer in butter fat, in the quantity of milk, and also in the sale of progeny. One is liable to judge his cow by the butter alone, which from one point of view is quite correct, but we must consider the quantity of milk for other purposes. With the high prices obtainable at the present time for store cattle, all calves should be reared if possible, and this with care and a little attention can easily be done on skim milk. In rearing calves on the bucket the worst enemy is scours, but if carefully watched and treated in the first stages, a great many losses will be saved. The most critical time is when a calf is from one month to six weeks old. The first symptoms will be noticeable in the droppings, which will first turn a streaky, yellowish-green, and then become very frothy. The moment I detect that, my own practice is to give a tablespoonful of castor oil, heating it in hot water and skimming it off. Then ten to twelve hours after I take one gill of o.p. rum, place it in an enamel plate, and set fire to it, leaving it to burn for about five minutes; then I mix it with a quart of fresh milk. If kept on new milk from the cows for a few days the patient's condition soon becomes normal. By these means I have very few losses. The second stage in growth is from three to four months, when calves should be closely watched.

To select a herd of good milking cows, one requires a good deal of experience, and the best way is to consider the breed that pays best. In my opinion the most productive breed is the Shorthorn, or Shorthorn and Ayrshire crossed. The Jersey crosses are also good. I have had no experience with Guernsey or Holstein, but have seen Shorthorn-Jersey, Devon and Ayrshires tried, and consider the Shorthorn as a pure breed the best, owing to the quantity of good test milk produced, and the size of the steers. One thing greatly in favor of the Shorthorn is that when the cow is dry, they gain condition very quickly when near calving.

In crossing with Ayrshires, either way of mating will produce a good animal, but in crossing with the Jersey always use a Shorthorn bull and Jersey cow, otherwise the Jersey bull will throw stock too much of his own breed. Never use a half-bred bull. No matter how good a cow may be, if mated with a crossbred bull there is a big chance of a cull, while if the bull is pure-bred, you have the double chance of getting a good animal. With a sire of two breeds and a cow of two breeds you will get the offspring of four different bloods, which may freak any way—more often for bad. I have purchased a good many bulls, mostly to advantage, but on one or two occasions to disadvantage. For instance, I bought a Shorthorn bull, four years old, from Grafton. His progeny grew well, but were very tight in the udder, and I am quite certain not one heifer was what one would call a good milker. I would advise anyone to select a bull from a good herd of the purest blood possible, as the sire is the foundation of the dairy. With a good sire you will get fair stock from almost any cow. In buying a bull, if you can procure an animal that is known to produce good stock it is better to pay a big price for him than to purchase an unknown beast.

I saw by a New Zealand paper that one of the leading dairymen of the Dominion recommends using a bull until five years of age, after which he considers the vigour declines, but I consider an aged bull, say nine to twelve years, will produce calves equally as good in stamina on condition he has not been overdone, and will show more of his own breeding than a young animal will.

When calving season begins, I make it a practice to bring the cows into a paddock, where they cannot stray, for sometimes if a cow calves away from home the calf will suck perhaps only one or two teats and leave the others; this means trouble, and sometimes, if the cow is a big milker, the loss of a teat. With big milkers, one must guard against milk fever. It is a much dreaded complaint, but easily prevented. When my cows calve I always keep the calf on the cow for the first week and longer if there are any signs of swelling or inflammation. I milk the cow leaving a little milk behind, and then let the calf drain out well, as there is always a little milk left that cannot be got away by the hand. A second advantage is it gives the calf a start on natural food. If the cow is badly swollen and the udder is hard, I bathe with warm water, massage well, and apply lard, which prevents chafing.

As this is only for amateurs, a word on breaking in heifers might be useful, for the way a heifer is handled has a lot to do with the future cow. The quieter the cow is, the better servant she proves. When the heifer is brought in, if wild I rope her, and while one keeps the rope tight, with a push behind she generally goes into the bail easily. If she proves obstinate, I put a piece of rope on one forefoot and it is quite easy to pull a big cow along in that manner. When in the bail I never use a leg-rope. Sit down and take hold of the opposite leg when she struggles, and after a few milkings you will find no trouble in getting her to stand still. Always keep the calf at the heifer's head while milking for at least a week. I have the bails constructed so as to let the cows go through when milked. A heifer, after a few days will come to the bail to get through. Since the Necessary Commodities Act came into force, I have worked my cows to calve in the early spring, drying off in May, and giving the cows about three months' spell. I always take especial care to see a cow is properly dry before letting her go, as otherwise there is a grave danger of udder trouble. I bring the bull among the cows about the middle of December, having the cows three months empty, which is a big benefit, as it gives them time to gain strength.

Members of the branch paid a visit of inspection to the orchard of Mr. R. E. Peck, at Upper Colo, on 19th February, for the purpose of inspecting the plant he has installed for the pulping and canning of fruit. The installation is a very complete one, and the demonstration was thoroughly convincing as to the utility of the method. As a means of turning to profit fruit that would otherwise be wasted, it impressed all. Mr. Peck related that once during this season he took three bushel cases of apricots from a heap that was really going to waste. The fruit was transformed into pulp and then into jam, eight dozen 27-oz. tins of good apricot jam being the result. On being sold, the exact net return, after deducting sugar, tins, &c., was £1 13s. 4d., or an average of 11s. 1⅓d. per bushel case.

Matcham.

A meeting of this branch was held on 10th February, at which seventeen members were present. Papers were read on the prevention and cure of colic in horses, and on the drenching bit and its use.

A discussion also took place on the bot-fly in horses.

Middle Dural.

A meeting of the branch was held on 8th February. There was a lengthy discussion as to the assistance which the Government should render to the man on the land, more particularly the fruit and vegetable grower.

Mittagong.

A meeting was held on 27th January, when a letter from the Department of Agriculture, addressed to Mr. A. E. Boswell, regarding mortality in bees as a result of orchard spraying, was read for the information of the members.

Mr. Troy read a paper on common diseases of dairy cattle, and their home treatment, which was followed by a discussion. Mr. Troy was accorded a hearty vote of thanks for his paper.

The last meeting of the branch was attended by Mr. R. N. Makin, Inspector of Agriculture, and was held at the Boys' Farm Home, Mittagong. Experimental plots there were inspected and many sections of the potato plots harvested. The members were much interested in the work carried on at the institution.

Nimbin.

A meeting of this branch was held on 3rd March. After discussion it was decided to help in the organisation of a district exhibit for the Royal Agricultural Show, Sydney. Members subsequently took part in a discussion on the subject of winter treatment of dairy cattle.

Spencer.

A meeting was held on 23rd February, at which Mr. E. C. Allen read a paper from which we take the following:—

THE VALUE OF INTERPOLLINATION.

There are two agencies by which interpollination is brought about—(*a*) bees, and (*b*) wind. In my opinion the former is the chief and the most reliable, as the wind at the opportune time may be too strong and defeat the purpose by scattering the pollen far and wide, depositing much of it where it is lost. This does not occur where bees are concerned, as they are continually changing from tree to tree in all weathers (of course, excepting rain), thereby completing the process of interpollination where the wind probably fails.

In planting an orchard for interpollination purposes, it must be understood that different varieties of the same species of fruits must be planted, also that they burst into bloom as nearly as possible at the same time. The varieties should be judiciously mixed, not planted on the block system, thereby giving each tree a fair chance of pollination.

That interpollination is conducive to good and regular cropping of fruit-trees has been proved by some of the leading Victorian growers, who, after planting their orchards on the block system with bad results, overcame the difficulty at first by placing small branches of other varieties in pots of water and hanging them in the trees during the blooming period. This necessitated a lot of work, however, and they later resorted to grafting other varieties on to one limb of each tree.

St. John's Park.

The meeting was held on 16th February, at which Mr. J. Seccomb delivered a lecture on irrigation.

The lecturer remarked that most publications on the subject of irrigation dealt with the subject on a large scale, and assumed that the supply of water would be large. This would be of little use in a district where the greatest care had to be taken in the use of water. He discussed the two methods which could be employed; namely, supply through tile drains and overhead water pipes and nozzles. He pointed out that the district was adapted for the latter system, and that the pipes should be erected high off the ground and run in long lengths, 30 to 50 feet apart.

In answering a question, the lecturer stated that it would be too costly to run the water down furrows, as too much was wasted. He advised 1¼-inch piping from the main, then 1-inch to the ground and ¾-inch pipes to irrigate with.

Tallawang.

A meeting was held on 3rd February, when two interesting papers were read.

Mr. T. Collins discussed the prospects of wheat-growers, taking the view that they are discouraging in the light of recent developments, and contrasting the advantages of grazing live stock, which was much more profitable.

NATIONAL ECONOMY IN TRAINED FARM LABOUR.

Mr. S. E. Hinder, Hon. Secretary to the branch, read a paper in which he pointed to the fact that so many young men with thorough farm training should wend their ways citywards, just when they were of greatest worth as farmers. Though there might not be a great deal of foresight in this pursuit of city employment, it was evident that the city's easy jobs and ready money, and its joys and pleasures, took toll of hundreds of healthy, well-trained farm hands every year.

As this movement was partly in pursuit of the pleasures and attractions of the city, Mr. Hinder suggested that something should be done to counteract that influence by increasing the attractiveness of country life, and somewhat reducing the hours of labour. The praccice by which man[illegible]ns of farmers had no regular income or wage also required correction, and the suggestion was made that farmers should permit their sons to farm a small portion of the holding or to graze a few sheep or cattle of their own. An effort should be made to provide good reading, by some improved system of the "book-box from town," which, instead of providing what he called "some dry old out-ot-date work on agriculture," should supply farmers' sons and daughters with good fiction just as city workers were treated. Finally, he advocated the erection of a hall, with facilities for entertainment, and also for profitable employment on the lines ot self-improvement. Some such measures he regarded as essential to the prevention ot the drift towards the city.

Toronto.

A meeting of this branch was held on 21st February. After the formal business, members took part in a discussion on sprays and spraying.

Mr. W. Bennett gave some interesting information on his methods of tomato culture.

Mr. H. Filmer also gave some of his experiences of the result of planting tomatoes out in land too richly manured.

Walla Walla.

At the annual meeting the following officers were elected :—Chairman, Mr. A. J. Wenke; Vice-Chairman, Mr. R. P. Shipard; Hon. Secretary, Mr. H. Smith.

Woonona.

A meeting was held on 13th February, at which Mr. George Fowler continued his paper on poultry-farming for profit, dealing chiefly with reproduction.

The advisability of holding a show amongst members was also discussed.

Yarramalong.

A meeting was held on 3rd March, at which twenty-one members were present. After the general business, the existing condition of the fruit market was made the subject of an interesting discussion. Some favoured a co-operative canning factory to be established at the nearest railway centre. Others favoured a more thorough investigation of the matter before any steps were taken. The latter course was ultimately adopted, and the manager of the Coastal Farmers' Co-operative Society is to be asked to deliver a lecture to members on the present conditions.

Orchard Notes.

APRIL.

W. J. ALLEN.

THE picking and packing of the later apples for market or storing will continue this month. Fruit intended for either cool store or ordinary storage at the orchard should be entirely free from bruises. It should be picked while the fruit is cool and put into store as soon as possible after picking.

Green Manuring.

If green manure crops are not already sown, this work should be done without delay, otherwise it will not make sufficient growth before it is time to plough it under during the latter part of the winter.

Planting.

The planting of citrus trees may be continued this month. Care should be taken when planting not to allow the roots to become dry by exposure to either the sun or wind. If it is intended to plant out any new areas with deciduous fruits, the land should be cleared and subsoiled as soon as possible, if not already done. There should be no delay in ordering trees from the nursery. A stipulation should be made that the trees are worked on stocks suitable for the district, and especially that all apples be on blight-proof stock. Where refills are to be planted in established orchards, it is a good plan to remove a load or two of the old soil and fill in with fresh soil.

Citrus Scale.

If the trees are in good condition they can be fumigated or sprayed this month. If this work is carried out not later than this month the dead scale will have cracked off the growing fruit by the time it is fit for market, whereas if the treatment is delayed the fruit appears scaly, although the scale may be dead, and will not be allowed to enter the New Zealand or our Interstate markets. Fumigation tables and bulletins on "Spraying" may be obtained from the Department of Agriculture.

Liming.

The present season is a good time to give an application of lime to sour or heavy and sticky soils. From 5 to 10 cwt. of ordinary builder's lime (where so-called "agricultural" lime is not obtainable) is a satisfactory dressing.

Cultivation.

In some districts where it is important to catch and store all the autumn and early winter rain, and where cover crops have not been sown, it is a good plan to plough the orchard now, otherwise it is well to let the land rest until the winter ploughing, when all the weeds that have grown can be turned under to help in keeping up the humus-content of the soil.

Manuring.

Any available farmyard manure should be carted out and spread amongst the trees. The application of bush scrapings and soil should be made to citrus trees as time and weather will allow.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Royal Agricultural Society of N.S.W.	H. M. Somer	April 3–11
Clarence P. and A. Society (Grafton)	G. N. Small	„ 18, 19, 20
Orange A. and P. Association	W. J. I. Nancarrow	„ 18, 19, 20
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	„ 18–21
Wellington P., A. and H. Society	A. E. Rotton	„ 24, 25
Upper Manning A. and H. Association (Wingham)	D. Stewart	„ 25, 26
Lower Clarence A. Society (Maclean)	K. McKay	„ 25, 26
Dungog A. and H. Association	W. H. Green	May 2, 3
Coonamble P. and A. Association	J. C. Wilson	„ 2, 3
Kyogle P., A. and H. Society	D. Campbell	„ 9, 10
Hawkesbury District A. Association (Windsor)	H. S. Johnston	„ 10, 11, 12
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	„ 21, 22, 23
Parkes P., A. and H. Association	G. N. Seaborn	„ 22, 23
Forbes P., A. and H. Association	J. H. Bates	Sept. 4, 5
Albury and Border P. A. and H. Society	W. J. Johnson	„ 4, 5, 6
Manildra P. and A. Association	A. Anderson	„ 5
Ganmain A. and P. Association	T. S. Henderson	„ 11, 12
Young P. and A. Association	T. A. Tester	„ 11, 12, 13
Lockhart A. and P. Society	E. D. Arnold	„ 12, 13
Cowra P., A. and H. Association	E. W. Warren	„ 18, 19
Narandera P. and A. Association	H. S. Robinson	„ 18, 19
Holbrook P., A. and H. Society	J. S. Stewart	„ 19, 20
Canowindra P., A. and H. Association	G. Newman	„ 25, 26
Murrumburrah P., A. and I. Association	J. A. Foley	„ 25, 26
Yass P. and A. Association	E. A. Hickey	„ 26, 27
Junee P., A. and I. Association	T. C. Humphreys	Oct. 2, 3
Ardlethan P. and A. Society	W. J. Nixon	„ 3
Deniliquin P. and A. Society	L. Harrison	„ 3
Hay P. and A. Association	G. S. Camden	„ 10

1918.

Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	Mar. 13, 14

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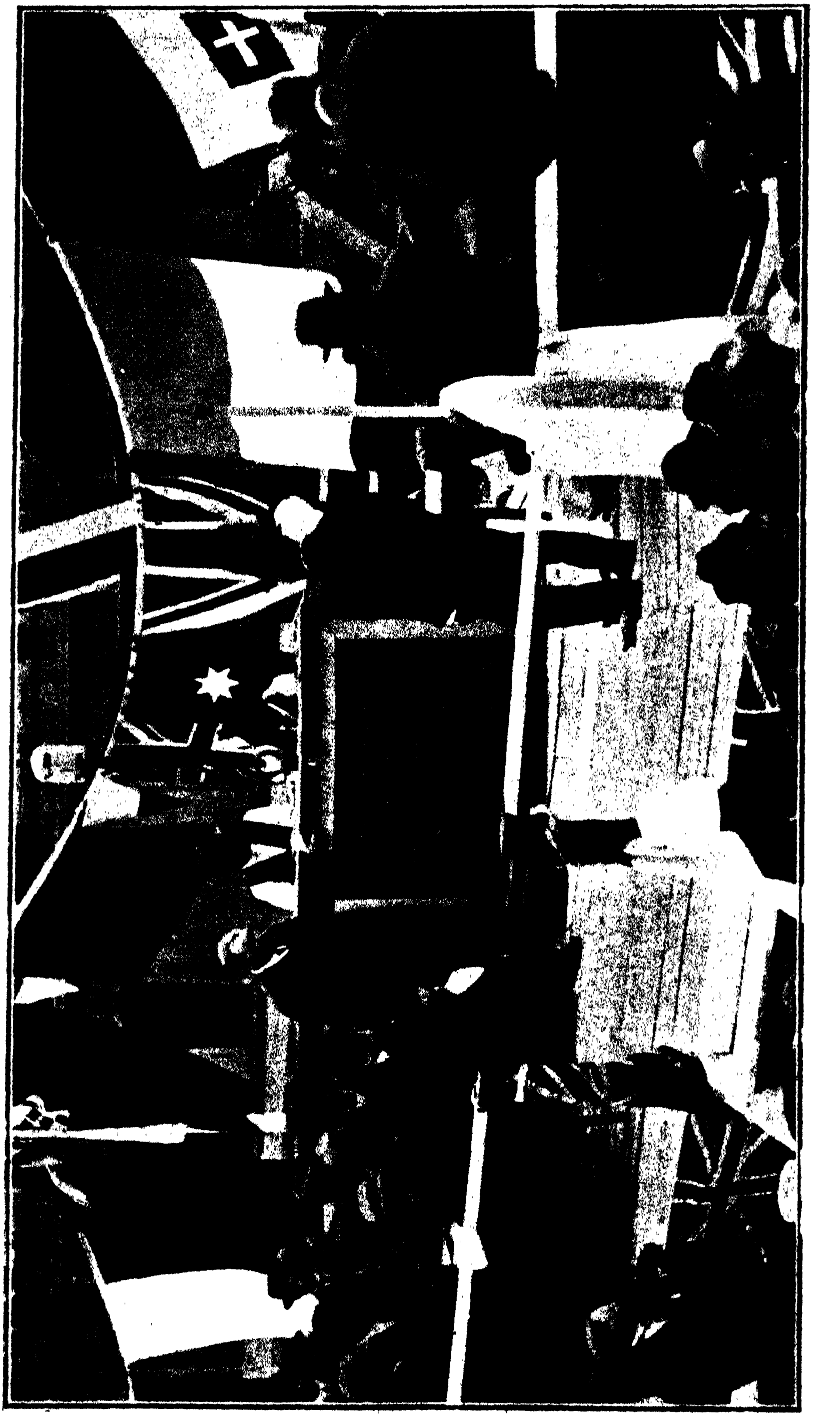


Laying the Foundation Stone.

THE DEPARTMENT'S NEW BUILDING.

VOL. XXVIII. PART 5. MAY 2, 1917.

Agricultural Gazette of New South Wales.

The Department's New Building.

LAYING THE FOUNDATION STONE.

WHAT must be considered another historic stage in the history of the Department was the laying of the foundation stone of the new building by the Minister for Agriculture, the Hon. W. C. Grahame, M.L.A., on Wednesday, the 21st March. Among those present at the function it was interesting to note the Hon. Sydney Smith, who as Minister for Mines at the inauguration of the Department in 1890 became the first Secretary for Agriculture, Mr. H. C. L. Anderson, M.A., the first Director of Agriculture, and Mr. W. S. Campbell who was closely associated with the infant Department.

Among others present were Messrs. J. Davis, Director-General of Public Works, Arthur J. Hare, Under Secretary for Lands, R. H. Cambage, Under Secretary for Mines, Peter Board, M.A., Director of Education, and a large number of officers of our own and other Departments.

In a few remarks, preliminary to the main function, Mr. George Valder, Under Secretary and Director of Agriculture, said that the opinion might naturally be expressed that the present time was somewhat inopportune for proceeding with the erection of such a building. His answer to that was the necessity which existed for the adequate accommodation of the Department. This had been urgently required for years, and the present Minister had recognised the ever-pressing need of putting the work in hand. The administrative staff was at present crowded into a few rooms in the Lands Department building, and many of the officers were working under insanitary conditions. Other branches of the staff were located in all sorts of out-of-the-way corners throughout the city. There the officers were not getting a fair chance, and under the circumstances it was not possible to do justice to the many farmers, and others, who came seeking advice or to transact business. At the conclusion, Mr. Valder handed the Minister a silver trowel which had been presented by the officers of the Department.

Mr. Grahame, before the brief formality of setting the foundation stone, gave a brief history of the Department, outlining the remarkable progress made in various directions. He dwelt briefly upon its educational, experimental and investigational activities, and said that rapid and substantial as the progress had been, especially during the past decade, he believed that the Department was only in its infancy as a prime factor in the agricultural development of the State. He confidently predicted that before another ten years had gone by, agriculture would be the most important Department of State in New South Wales, especially with the handling of large wheat crops in view. Vast areas still lay dormant, untouched by the plough, and there was every evidence that primary production would increase by leaps and bounds. With the bringing together under one roof of all the scattered sections of the staff their usefulness would be much increased, and science and practice working hand in hand would materially assist in increasing the output of the better-known primary products and encouraging the extension of new ones.

The new structure will be erected on the site of the old Education Buildings, and together with the present Public Instruction Offices will form one of the most imposing blocks of public buildings in the city.

The estimated cost of erecting the proposed new offices is £121,700, in cluding the cost of demolishing the old buildings that stood on the site. The design is for a building of six stories, with basement. The total floor space will be about 50,000 superficial feet.

The Roll of Honour.

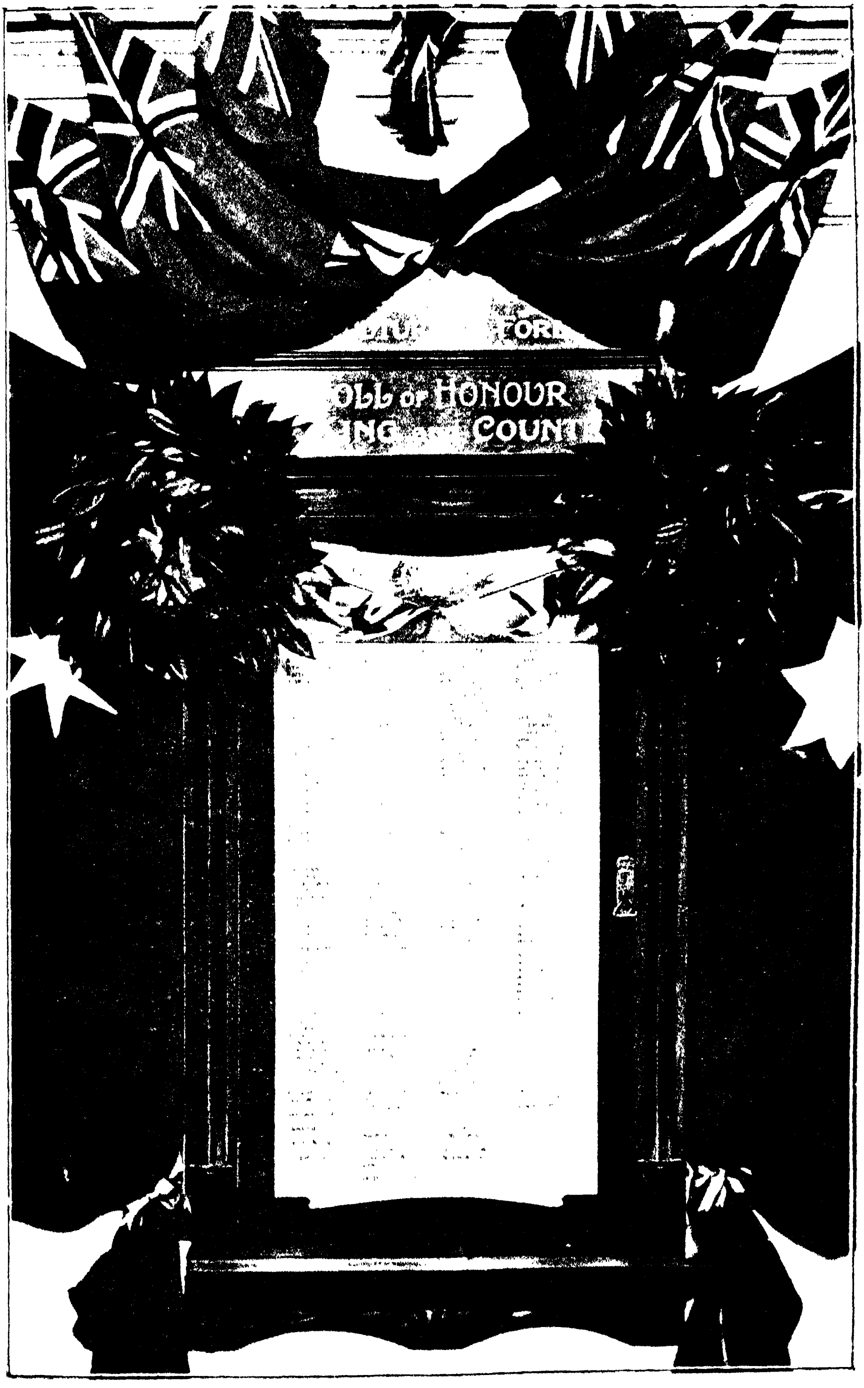
THE DEPARTMENTS OF AGRICULTURE AND FORESTRY.

OPPORTUNITY was also taken on the 21st of March to unveil a Roll of Honour, placing on record the names of officers of the Departments of Agriculture and Forestry who have volunteered for active service.

Mr. Valder, in asking the Minister to perform the ceremony, expressed his highest satisfaction at the manner in which the staff had responded to the call of Empire. From laboratory, office and field about 180 officers and employees had enlisted, and it could easily be understood that the burden of carrying on the functions had been heavy on the balance of the staff, but all ranks had cheerfully applied themselves to the duty of preventing any dislocation of activity. The loss on the staff of inspectors of agriculture and experimentalists had been heavier than in other directions, with the result that the work which would otherwise have been attempted had necessarily been postponed.

The men who had gone to the front had invariably given a good account of themselves, but, as was unfortunately only to be expected, they had had to bear their share of the casualties. They had also won a good proportion of distinction and promotion, one having won his way to the high rank of Lieut.-Colonel, and there were a number of Captains, and many others of lower commissioned and non-commissioned ranks. The Lieut.-Colonel was awarded at different times the D.S.O. and Military Cross; another officer also secured the D.S.O., while still another was awarded the Military Cross.

Mr. Grahame voiced the hope of all his officers that the majority of those who had answered the call would return to continue their effective association with the Department. The numbers who had gone constituted a very substantial percentage of the whole staff, but he had felt that the claims of oversea duty over-rode even those of production in this State. In unveiling the Roll of Honour he was glad to place on record his high appreciation of the way these men had volunteered for national service.



Roll of Honour for the Departments of Agriculture and Forestry.

The Farmers' Experiment Plots.

A REVIEW OF THE RESULTS WITH WHEAT.

H. ROSS, Chief Inspector.

IN last month's *Agricultural Gazette* the results were published of the farmers' wheat experiment plots in the southern, western and northern districts of the State, and it is worth while to review the results because they reflect the experience gained in a season so extraordinary in the incidence and the amount of its rainfall that it will not easily be forgotten. Excessive rains during the growing period, development of rust (*Puccinia graminis*) at the critical period of the formation of the embryo grain, hail and windstorms just prior to harvesting, are factors that find out the weak points of every variety of wheat—even the champions. These climatic conditions were experienced in almost every part of the State where wheat is grown for grain, and it is, therefore, interesting to note how the principal varieties behaved in the respective districts.

The Variety Trials.

Starting with what, it will be admitted, is the most popular, and, on the whole, the best yielding wheat—Federation—we are confronted with the fact that, though it suffered severely from the ravages of rust, it upheld its reputation in most districts as a yielder of grain, and it would be difficult, indeed, to recommend any better variety as a main cropper for grain in the south and west.

One of the outstanding features of the experiments is the comparative yields of Federation and Hard Federation. In the north-western district the selection beat the original variety in every one of eight trials. I quote the figures as supplied by the Inspector for that district:—

	Manilla.	Gunnedah.	Narrabri.	Narrabri.	Wee Waa.	Pallamallawa.	Inverell.	Currabubula.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb.	bus. lb.	bus. lb.	bus. lb.
Hard Federation ..	16 18	15 53	17 3	6 26	15 34	20 41	5 0	21 44
Federation	11 51	7 40	14 20	4 42	7 51	18 48	4 0	20 36

On the Western Slopes, the South-Western Slopes, and in the Riverina, the results are not so striking, though in the Central Western plots three out of four trials were in favour of Hard Federation. The Inspector for that district remarks that Hard Federation "did not suffer from rust to such a pronounced extent as did Federation . . . . A feature especially noticed throughout the harvesting of this variety was the small amount of chickwheat obtained."

Notwithstanding that in the southern districts Federation beat Hard Federation in every instance, farmers are recommended not to discard the new strain in those districts until it has been tested in a normal season.

Canberra, a hybrid from Federation and Volga barley, and an early maturing variety, has so far sustained its reputation that it is worthy of further trial. The weakness of its straw was its chief drawback during the past season.

Florence is not much grown in most parts; yet for dry western conditions it is undoubtedly one of our best sorts. The results on the plots and advices from private farmers point distinctly to the fact that it resisted the attacks of rust in a more pronounced degree than any other variety. It is valuable for both hay and grain.

Well-known favourites such as Marshall's No. 3, Rymer, Yandilla King, Bunyip, Steinwedel and others yielded according to the localities they were sown in, early maturing varieties best suiting the north-western districts, and late maturing ones the south-western and the Riverina.

As a whole the returns are eminently satisfactory from a commercial point of view, though the experimenters can only draw conclusions from the results after making due allowance for the many disturbing features of the season.

Manurial Experiments.

The manurial trials in the western and south-western districts generally confirmed previous results. That additions of superphosphate pay, there can be no gainsaying. Tests were carried out with 28 lb., 42 lb., 56 lb., 70 lb., and 84 lb. of superphosphate respectively. In some instances dressings of 70 lb. and 84 lb. per acre gave payable increases over 56 lb., and in others the reverse was the case. Speaking generally, more evidence will be required to vary the Department's general advice to farmers that their applications of superphosphate should approximate ½ cwt. per acre.

Even on the lighter soils in the north-west, the use of superphosphate has given negative results, for while in two instances increases were obtained by its use, in another no benefit resulted, and in yet another the yield was actually decreased by 3½ bushels. This experience is quite in conformity with previous results.

The "Value of Lime" and Other Trials.

Experiments to test whether it is worth while to use lime on wheat land were conducted in both southern and north-western districts, from ½ ton to 1 ton per acre being applied. It must be confessed that so far the results do not appear to justify the expenditure involved, for no substantial increases were obtained. At the same time, it should not be taken for granted that lime will have no beneficial effect on the soil, as it is quite possible that subsequent crops may show more advantage from the treatment than the first one.

Rate of seeding tests, acclimatised seed *versus* introduced seed, graded *versus* ungraded seed, early *versus* late sowing, crop-harrowing and fallowing were all the subject of special experiments; but owing to the abnormal season the results in most cases were not of a very comparable or highly satisfactory nature, and definite conclusions can hardly be arrived at.

The extent of the plots as one of the Department's means of bringing best methods under the notice of farmers can be gauged by the statement that they covered such a multiplicity of matters as have been mentioned, and an area of not less than 340 acres.

By way of conclusion, the attention of farmers may be directed to the recommendations of the Department as to varieties, time of sowing, and so forth, in the February issue of the *Gazette*. Those recommendations were framed in light of the experience on the farmers' experiment plots and on the Department's experiment farms during the past season, as well as in preceding years, and the advice should therefore be carefully considered.

ERADICATION OF BLACKBERRY.

BLACKBERRY vines are a most difficult pest to eradicate. Merely cutting down only tends to strengthen the root growth and ultimately to increase the trouble.

Where the pest is confined to a small area intended for constant cultivation, trenching to a depth of 18 inches to 2 feet and removing all growth to that depth, is the surest way, though perhaps somewhat laborious. Every part, roots, butts and vines, should be burnt.

Another method now being tried by this Department is the caustic soda treatment. This chemical, of a strength of 2 lb. caustic soda to 4 gallons of water, has the advantage of being non-poisonous, and is best applied as follows:—

First cut the vines down close to the ground, and when dry enough burn them. Then from a watering can, with the rose attached, give the surface from which the vines have been cut, a thorough soaking of the above solution. The area is then left until a new growth springs up and has grown to 4 or 5 inches high. It is not necessary to cut this growth down, but it is advised to give it a further soaking of the solution, which will soon kill more of the tops and root, but perhaps still will not kill the lot. This process will need to be repeated, so as to keep the leaf growth in check, for it is only by keeping the tops down that the roots can be ultimately overcome.

A strong brine solution, similar to that used by butchers for salting down meat, applied in a similar fashion to the caustic soda solution, will give the same results, and both these substances have the advantage of being ultimately washed out of the soil by rain, owing to their being so highly soluble in water—a big point in their favour for land that is required for cultivation.

A solution of arsenite of soda acts in a similar way, but owing to its highly poisonous nature, and the danger from children picking the fruit, it is not recommended.

Where the infested area is extensive, and is securely fenced, a flock of sheep or goats kept on it for a few months helps greatly in eradicating this pest.

THE FRUIT INDUSTRY IN THE WINDSOR AND KENTHURST DISTRICTS.

[The following is a summary of an interesting report supplied to the Department by Mr. Spinks in the course of his official duties. The references to the effectiveness of spraying and fumigation are especially noteworthy.—ED.]

THE season of 1916–17 will long be remembered by fruit-growers throughout this district as one of the worst experienced. The returns generally have been exceedingly unsatisfactory, and losses from several causes have been very heavy. These causes may be briefly enumerated as follows:—

1. The tremendous crop of stone fruits, as well as heavy intermediate citrus fruits, brought about enormous supplies.
2. The keeping quality of the fruit was very bad, owing to the soil being overcharged with moisture. As a consequence, fungus diseases (particularly Brown Rot) were rampant, and rendered useless many thousands of bushels of fruit. These diseases also compelled many orchardists to harvest their fruit in a rather immature condition in order to avoid loss, and the quality and colour of the fruit was therefore below the standard.
3. There was general scarcity of suitable labour, and perhaps, also, the stress of war conditions somewhat curtailed the spending of the general public on fruit.

Other causes adding to the depression were the insufficient facilities for getting the fruit to market during the early part of the season owing to the coal strike, and at times the restricted purchases by jam factories. This rather formidable combination of causes has proved disastrous to fruit-growers, and generally it will be found that the season's income will be far below expectations; it certainly will not be commensurate with the expenses incurred in labour and material.

Apart from the great loss occasioned from an over-supply is the equally severe loss caused by disease, chiefly Brown Rot, and in a minor degree by fruit-fly, codlin moth, and other pests.

Brown Rot does not appear to be receiving adequate attention. In every season which may be termed "drooping" or moist, heavy losses occur from this disease, but it is very noticeable that where orchards have been treated for fungus diseases, this destructive complaint is in great measure checked. The remedies which seem to have been most effective are lime-sulphur and Bordeaux mixture—lime-sulphur applied as a winter spray, followed by Bordeaux just as the buds are beginning to swell, and again in a weaker strength when the fruit is thoroughly set and well formed. I believe, from the results of this treatment, that if the remedy were universally applied, the disease would be checked to a very considerable extent. About 30 per cent. of this season's crop was lost in consequence of the ravages of Brown Rot.

Fruit-fly this season has been less prevalent than for years past, the losses being infinitesimal. Codlin moth also appears on the decrease. Where thorough and conscientious treatment with arsenate of lead is carried out, the results are invariably satisfactory and gratifying to the orchardist.

Scale insects are showing up rather badly at present, and various treatments are being applied. Many who are unable to provide themselves with the necessary outfit, however, are still obliged to carry out the less effective treatment of spraying. For this purpose miscible oils are preferred. Several brands have been used with varying success, but there is not a great deal of difference in the general results of the brands most generally used.—W. H. SPINKS, Inspector under Fruit Pests Act.

Wheats for Hay under Irrigation at Yanco Experiment Farm.

J. M. PITT, Acting Experimentalist.

[The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials. Later, when results for (say) five years are available, a summary will be prepared, as sufficient evidence should then be on hand to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.]

WHEAT experiments at this farm during 1916 were confined to early, mid-season, and late sowings of a number of varieties, the object being to determine the most suitable variety to grow for hay in the district, and the time to sow. The early sowing was not made until the 13th April, delay being caused by the late arrival of portion of the seed. The later sowings followed at intervals of three weeks.

The first quarter of the year being dry, the land, which had been lying in fallow since the previous November, had a good chance to sweeten. The preparations for sowing (discing, cultivating, irrigating, putting in check banks, &c.) were made during the latter end of March and early in April. An application of water a few days before each sowing was necessary to ensure a suitable seed-bed and an even germination.

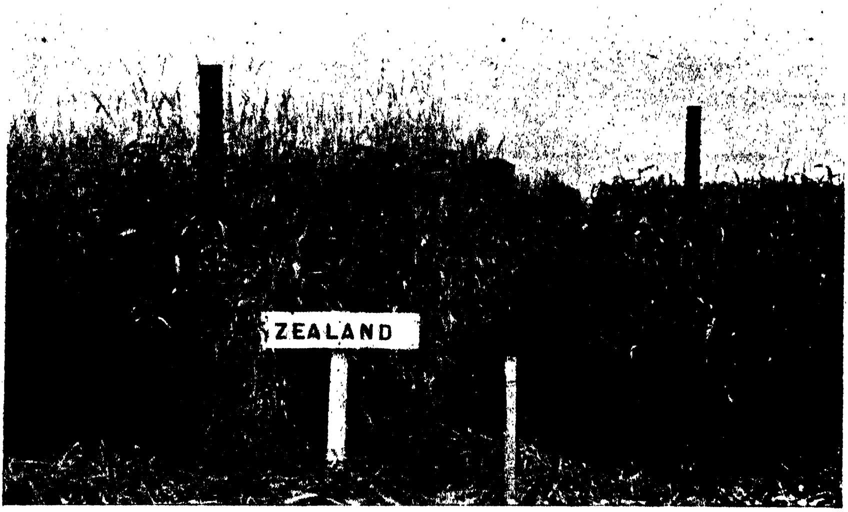
In all plots, the seed was sown at the rate of 45 lb. per acre, together with superphosphate at the rate of 60 lb. per acre.

The Season.

For several weeks after the early sowing the weather remained dry, and, as the seed had germinated well and the young plants showed signs of going off, a further watering was given on the 13th May. Dry weather fortunately continued until the end of May, thus allowing of all the sowings being made in order. The late-sown plots had just germinated when the rainy season commenced. All through June rain continued almost without a break, there being, as the graph on page 313 shows, twenty-one wet days. This, together with the almost total absence of sunshine, made the young growth, especially in the late-sown plots, drawn and spindly. Antarctic depressions, bringing further rains and cold weather, continued with monotonous consistency throughout July and August, during which time the plots showed a good growth. For the greater part of September more sunshine ruled, the plants making good headway, stooling well, and, in the case of the early-sown plots, growing rapidly. During the last week in September and first week in October a monsoonal disturbance caused a fall of a further 6 inches of rain, and this being accompanied by gales of wind, a fair amount of lodging took place, especially in the early-sown plots of Steinwedel, Florence, and Marshall's No. 3. The rain continued to fall at intervals throughout October and November, and it was only with great difficulty that a chance to cut was obtained, the land being too wet to allow of the use of the reaper and binder. It was owing to this fact that the early-sown, early-maturing varieties had gone past their proper cutting stage when harvesting commenced, thus showing that there is a risk in growing these varieties too early.

The Varieties.

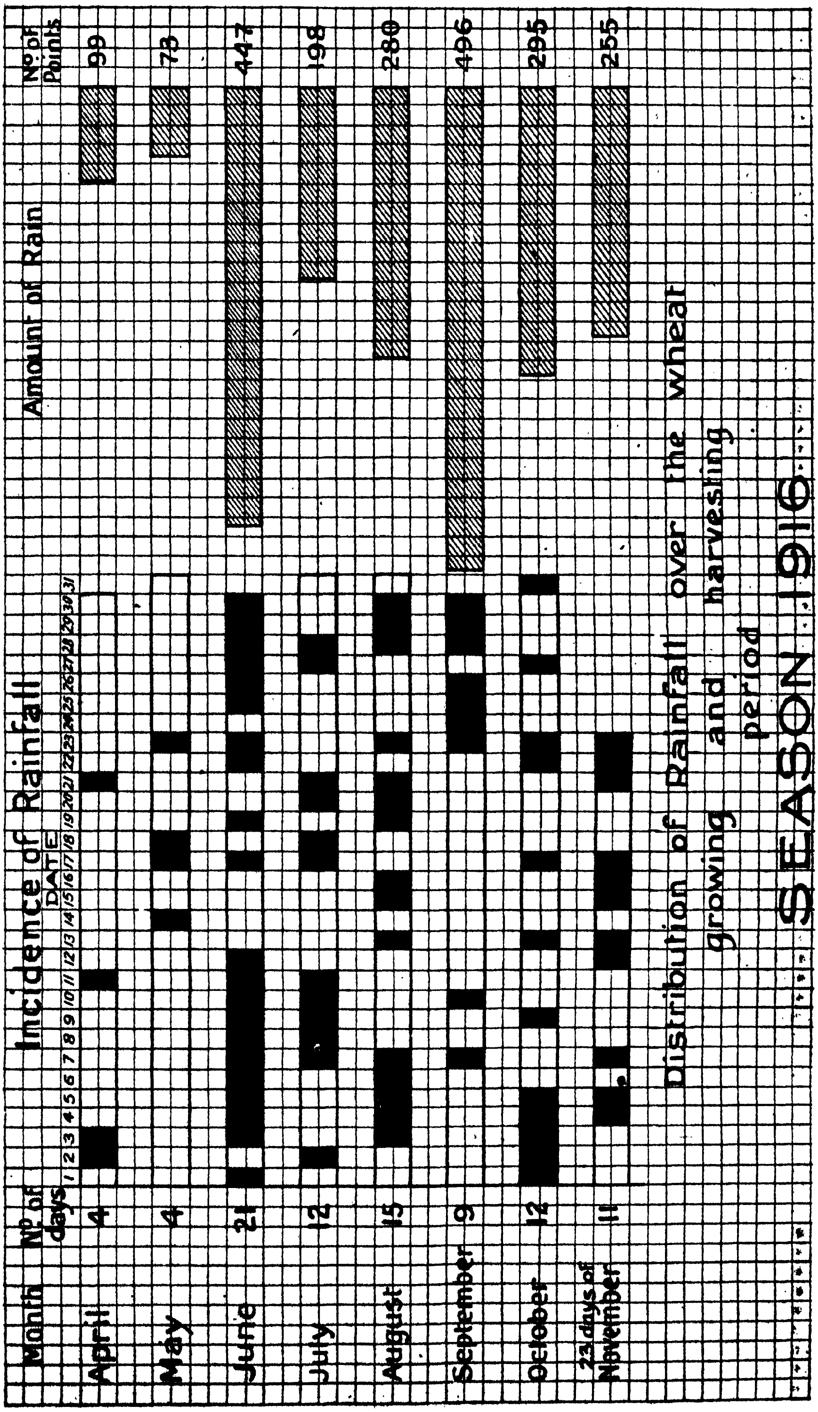
Zealand.—This is a late-maturing variety, giving best results when sown early, although this year, owing to the lengthy season, it yielded well for all sowings, and easily proved itself our best hay wheat. The early-sown plot had a good start before the rainy season commenced, and on one or two plots it eventually reached 6 feet in height, odd patches growing as high as 6 feet 7 inches. This variety was used for the check plots, and in every instance it suffered less than the other varieties from lodging. This is due probably to the straw being stouter. Carrying a large amount of flag, it makes a splendid hay. In the mid-season and late-sown plots there were several places where it was over 5 feet in height.



Zealand, early sown. Yielded 3 tons 19 cwt. 10 lb. of hay per acre.

Marshall's No. 3 is a late mid-season variety, maturing a little earlier than Zealand. It stooled profusely, and carried an immense quantity of broad-leaved foliage. The early-sown plot grew to a height of over 5 feet, at which time a good deal of lodging was noticeable, probably owing to the straw being thin-walled, and to the quantity of flag being large. It did not weigh as heavily as was expected. The early-sown plot, although giving the best yield, was easily beaten in percentage yield by the mid-season sowing.

Yandilla King takes about the same time as Marshall's No. 3 to mature. It grows semi-procumbent during the early stages. It did not take too kindly to the excessive rainfall, all plots showing a yellowish tint on the lower foliage of the plants. The early-sown plots made good growth in September, out-distancing Marshall's No. 3, and eventually reaching over



Wheats for Hay under Irrigation at Yanco Experiment Farm.

5 feet 6 inches. During the heavy winds it lodged in patches. This variety makes splendid hay, the stalks and leaves remaining a good green colour after curing. The early sowing gave the highest plot yield, but the late sowing, which was also a fine plot, gave the highest percentage yield.

Rymer.—This is another late-maturing variety, stooling well, and making headway but slowly. It carries a large amount of dark-green foliage. During September it made good growth, eventually reaching about 5 feet high. It makes a good hay, the straw being fine, and of good colour. Very little difference was noticeable in the early and mid-season sowings. This variety took rust more than any of the others, especially the later sowing.

Steinwedel, a quick-growing, early-maturing variety, not a heavy stooler, carries a large amount of foliage. The early-sown plot grew to 5 feet 10 inches on the average. Unfortunately this plot could not be cut at the proper hay stage owing to rain interfering, otherwise it probably would have gone over 3 tons. A fair amount of lodging took place. The late-sown plot stooled very poorly, remaining spindly throughout. It yielded best of the mid-season and late-sown early-maturing varieties.

Firbank, early sown. Yielded 3 tons 3 cwt. 1 qr. 2 lb. of hay per acre.

Firbank is an early-maturing variety that leaves all others behind it in rapidity of growth. It is not a heavy stooler, but carries a fair amount of foliage. A good deal of lodging took place in the early-sown plot, which reached 5 feet 10 inches in height. Firbank makes an excellent hay, and is one of our best varieties. Cutting of the early-sown plot was delayed owing to rain, and a little weight was thus lost, notwithstanding which it yielded heavier than the plot of Zealand adjoining, as the table shows.

Florence, also an early-maturing variety, is an upright grower, stools slightly better than Firbank, and carries plenty of foliage. The early plot reached 5 feet 6 inches, and was delayed in cutting, otherwise it would have yielded better. A fair amount of lodging took place on this plot. The mid-season and late sowings did not do so well under the excessive rainfall, several patches failing in the early stages.

Yandilla King, early sown. Yielded 2 tons 16 cwt. 11 lb. of hay per acre.

Rymer, early sown. Yielded 2 tons 6 cwt. 1 qr. 23 lb. of hay per acre.

Wheats for Hay under Irrigation at Yanco Experiment Farm.

TABLE showing Results of Wheat Variety Trial for Hay, Yanco Experiment Farm, 1916.

Early Sowing.—Date 13th April, 1916.

Plot.	Variety.	Date Harvested.	Plot Yield.	Yield per acre.				Percentage Yield.
			lb.	t.	c.	q.	lb.	
1	Zealand (*check*)	27-10-16	3,020	3	19	0	10	100·0
2	Marshall's No. 3	27-10-16	2,315	3	0	2	14	79·3
3	Yandilla King	30-10-16	2,142	2	16	0	11	76·0
4	Zealand (*check*)	30-10-16	2,716	3	11	0	14	100·0
5	Steinwedel	16-10-16	2,190	2	17	1	12	85·3
6	Florence	16-10-16	2,368	3	2	0	2	97·9
7	Zealand (*check*)	30-10-16	2,270	2	19	1	22	100·0
8	Firbank	16-10-16	2,345	3	3	1	2	100·5
9	Rymer	30-10-16	1,774	2	6	1	23	74·1
10	Zealand (*check*)	30-10-16	2,456	3	4	1	8	100·0

Mid-Season Sowing.—Date 4th May, 1916.

Plot.	Variety.	Date Harvested.	Plot Yield.	t.	c.	q.	lb.	Percentage Yield.
11	Zealand (*check*)	3-11-16	2,170	2	17	3	14	100·0
12	Marshall's No. 3.	3-11-16	1,990	2	12	0	13	90·9
13	Yandilla King	3-11-16	1,726	2	5	0	22	78·2
14	Steinwedel	19-10-16	1,922	2	10	1	9	86·4
15	Zealand (*check*)	3-11-16	2,240	2	18	2	18	100·0
16	Florence	19-10-16	1,368	1	15	3	8	60·5
17	Firbank	19-10-16	1,888	2	9	1	22	82·8
18	Rymer	3-11-16	1,767	2	6	1	3	76·8
19	Zealand (*check*)	3-11-16	2,320	3	0	3	1	100·0

Late Sowing.—Date 25th May, 1916.

Plot.	Variety.	Date Harvested.	Plot Yield.	t.	c.	q.	lb.	Percentage Yield.
20	Zealand (*check*)	13-11-16	2,285	2	19	3	10	100·0
21	Marshall's No. 3.	13-11-16	1,728	2	5	1	0	77·4
22	Yandilla King	13-11-16	1,850	2	8	1	22	84·9
23	Zealand (*check*)	13-11-16	2,125	2	15	2	17	100·0
24	Steinwedel	30-10-16	1,300	1	14	0	5	62·7
25	Florence	30-10-16	984	1	5	3	2	48·7
26	Zealand (*check*)	13-11-16	1,968	2	11	2	4	100·0
27	Firbank	30-10-16	1,125	1	9	1	24	54·2
28	Rymer	13-11-16	1,468	1	18	2	11	67·2
29	Zealand (*check*)	13-11-16	2,290	2	19	3	25	100·0

Steinwedel, with 2 tons 17 cwt.; Florence, 3 tons 2 cwt. of hay per acre.

Comparative Trials with Rye Grasses.

ITALIAN *versus* WESTERNWOLTH'S RYE GRASS.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

COMPARATIVE trials with these grasses have been carried out for three successive years at Glen Innes Experiment Farm and at Hawkesbury Agricultural College. Westernwolth's Rye grass has also been tried on a smaller scale at the Yanco and Grafton Experiment Farms.

Concerning the trials carried out at Hawkesbury Agricultural College, Mr. W. D. Kerle, Experimentalist, reports as follows:—

A trial of these two grasses was continued during the season 1916.

The sowing was made on the 15th June, 1916, in soil of a light sandy nature, with a clay subsoil; 16 lb. of seed per acre being used. The germination in each plot was very satisfactory.

The growth was rapid, particularly in early spring, and when cut for hay the *Lolium Westernwoldicum* was 3 feet 7 inches, and the *Lolium Italicum* 3 feet in height.

From seeding to flowering 17·470 inches of rain fell, the months of October and November being exceptionally wet, which caused the crop to lodge in places, and to become rust-infected. On 16th December portion of each plot was cut, and the yield of hay estimated. The remainder was left for seed, but was destroyed by heavy rainstorms. The yields obtained were as follow:—

	Yields per acre.			
	t.	c.	q.	lb.
Lolium Westernwoldicum (Westernwolth's Rye grass) ..	2	0	1	2
Lolium Italicum (Italian Rye grass)	1	16	0	26

With us Italian Rye grass is an annual, and is not as suitable for permanent pastures as Perennial Rye grass. There appears to be considerable variation in Italian Rye grass, both as regards productiveness and duration.

Westernwolth's Rye grass is an annual, which in appearance closely resembles Italian Rye grass. Botanically, it is also very similar; in fact, there is every indication that this grass is a much improved strain of the latter. It surpasses Italian Rye grass in the rapidity of its growth, and in weight of herbage; it matures considerably earlier, and very little variation is noticeable. Westernwolth's Rye grass is a comparatively new discovery, and is said to have been introduced from the county of Westerwolde, near the German frontier. It has been under trial here since 1913, and has given excellent results on poor sandy soils. It is said to thrive best on clay loams of a somewhat damp character. Excellent results have been obtained in New Zealand, where it is highly spoken of as an excellent hay grass. It can be strongly recommended for sowing with clovers in composite mixtures for temporary pastures, but particularly to be sown alone to be converted into hay, or used as green fodder for all classes of stock.

Conclusions.—The comparative trials with these grasses over three years have shown Westernwolth's Rye grass to be much superior to Italian Rye grass, consistently producing a taller and more uniform crop, and, in consequence, higher yields.

Trials at Glen Innes Experiment Farm.

In the first year's trial (1914-1915) very dry weather in the early stages considerably affected the subsequent growth, and the yields in both cases were small.

	Per acre. cwt.	qrs.	lb.
Italian Rye grass	13	0	2
Westernwolth's Rye grass	11	3	20

In the second year's trial (1915-1916) the plots suffered from the effects of the disastrous drought to such an extent that no yields of hay could be taken.

Mr. G. G. St. C. Potts, Experimentalist, reported:—

In comparing Westernwolth's Rye grass with Italian Rye grass there seems to be very little difference. The germination was practically the same, and the growth in each case averaged about 5 inches in height.

In the third year's trial (1916-1917) an area of 2 acres was sown to each grass, and Mr. Potts, Experimentalist, reports as follows:—

Date sown.—7th September, 1916.
Rate of sowing.—10 lb. per acre.
Westernwolth's Rye grass.—Germination excellent. Early growth comparatively quick, producing a fair amount of succulent fodder.
On 7th January, 1917, the ears were peeping; height, 15 inches.
On 14th January, 1917, flowering; height, 18 to 24 inches.
On 16th January, 1917, cut for hay; green fodder weight, 1 ton 15 cwt. 1 qr. 4 lb. per acre.

This grass is very similar to Italian Rye grass, except for the fact that the seed is borne on longer flower stems, with the spikelets further apart.

The growth is perhaps a little earlier, but the density of foliage is not quite so great.

Italian Rye grass.—Germination very good. Early growth comparatively slow, producing a fair amount of succulent fodder.
On 10th January, 1917, ears peeping; height, 1 foot.
On 10th January, 1917, flowering; height, 18 to 24 inches.
On 16th January, 1917, cut for hay.
Green fodder weight, 1 ton 18 cwt. 0 qr. 16 lb. per acre.

The foregoing information shows clearly that although the *Lolium Westernwoldicum* is a little quicker in growth, yet its density cannot be compared with the *Lolium Italicum* as the weights per acre clearly show. Up to the present this grass cannot be substituted for *Lolium Italicum*.

Other Tests.

Both at Grafton and Yanco Experiment Farms Westernwolth's Rye grass has given excellent results, although no comparative weights have as yet been obtained. At Yanco, however, it has been compared with an improved strain of Italian rye, called Loretto, and proved very superior to this grass. (See *Agricultural Gazette*, February, 1917.)

Review of Trials.

From the trials carried out up to date with Westernwolth's Rye grass there is a strong probability that it will prove superior to Italian Rye grass for the coast and irrigation areas, but appears inferior for the New England district. It is characterised by its rapidity of growth in its early stages, together with a uniformity in flowering and ripening, which render it very suitable from a harvesting point of view.

The Flying Fox.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

THE number of native non-marsupial mammals in Australia is very limited. Excluding the marine forms (seals, whales, and dugongs) there remain only the dingo or native dog, a number of species of rats and mice, and a considerable number of bats of various kinds. The bats (order, Chiroptera—hand-winged) can be divided into two distinct groups, the Fruit-eating Bats (or Flying Foxes) and the Insect-eating Bats.

The characteristics of each group are as follows :—

Fruit-eating Bat.—Face, dog or rat-like ; the nostrils, single openings without any leaf-like folds of skin surrounding them ; the ears, simple, usually pointed, the sides of the conch (*i.e.* the external ear) uniting in a complete ring at the base ; crowns of the molar (*i.e.* cheek) teeth smooth, with a longitudinal groove along the middle ; the second finger usually bearing a claw ; tail, very much reduced or absent. Feeds on fruits, flowers, and honey.

Insect-eating Bat.—Face, broad and short ; the nostrils, with or without leaf-like folds or appendages of the skin ; the ears, with the two sides not meeting at the base, often complicated by the development of special lobes ; crowns of the molars, with sharp tubercles, more or less separated by cross-furrows ; the second finger, without a claw ; tail distinct, united to the interfemoral membrane. Feeds on insects, rarely on fruit or blood.*

The most noticeable distinguishing feature between the two groups is perhaps the absence of tubercles upon the molar teeth of the fruit-eating bats ; the dentition of an animal being modified in connection with the food upon which it subsists. A further point of difference is that the lower jaw has an angular process in the insect-eating bats which is absent in the fruit-eaters.

It is a very remarkable fact that among all the host of extinct animals with which we are acquainted, none have been discovered in any way connecting bats with other mammals. Indeed, remains of bats very closely resembling existing kinds, have been found in old geological strata, showing that the family is a very ancient one.

The largest members of the family are the widely distributed Fruit-eating Bats or Flying Foxes which occur in Australia, Southern Asia, Fiji, and Samoa. In Australia there are five species :—the Grey-headed Flying Fox, the Dusky Flying Fox, Gould's Flying Fox, the Spectacled Flying Fox, and the Collared Flying Fox.

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* The Animals of Australia. Lucas and Le Souëf.

regards mode of action, it has been established that the bat rasps the skin rather than bites it, and thus planes off a minute shaving and causes the blood to ooze through the capillaries.

Vampire bats are especially abundant in the valley of the Amazon, and a real danger to the stock of horse and cattle owners, for though each bat takes but a few ounces of blood, repeated attacks by the besiegers rapidly weaken the unfortunate animals.

Dr. Tschudi reports that he kept his mule free from them by smearing it with an ointment composed of camphor, petroleum and soap; bats do not like the smell of this unguent, which is largely used to deter them.*

Of the five Australian species of flying fox, the one most frequently seen in New South Wales is the Grey-headed Flying Fox. The fur of the head is grey with a yellowish tinge; the neck, shoulders, and fore part of the breast are bright reddish yellow, the rest of the body being greyish black. It is a large bat, the head and body measuring about 8½ inches, and the fore-arm about 6 inches. There are some good stuffed specimens in the Sydney Museum. These flying foxes or fruit-eating bats are social animals. They select certain spots in the dense bush or in secluded gullies, where hordes of them hang from the boughs of the trees in the daytime. At night they leave these "camps" or "rookeries" in search of food. When bush-fires have been prevalent these flying foxes may often be observed in Sydney feeding upon the fruits of the Moreton Bay fig-trees.

It is because of their attacks upon orchards, however, that the flying foxes constitute a serious pest, and here it is not so much the fruit they eat as the fruit they damage and render unsaleable that matters. The bat bites a ripe fruit, which then falls to the ground; the bat then bites another and so on. The animal does not follow the fruit downwards, for it has the greatest difficulty in walking on the ground, and if placed there will climb up a post or tree with its claws in order to get a start for flight. Last year, Mr. Burrows, of the Agricultural Department, located nineteen flying fox camps.

In February last the writer visited one of these camps near Wauchope, in company with this officer, for the purpose of considering a suggestion which has frequently been put forward, viz., the possibility of destroying the pest by gas. There are a few gases that suggest themselves for use: chlorine, sulphur dioxide, arsenic trichloride, and hydrocyanic acid. Chlorine is a heavy gas, easily prepared, and easily condensed in cylinders. It has a most pungent smell, and if inhaled irritates the mucous lining of the lungs. It is heavier than air, and, wafted by the wind, has been used in warfare to sweep over country otherwise unassailable, country which sometimes must be held at all costs. This latter point is emphasised because, in the case of attempting to destroy bats by gas, one finds that they have no predilection for staying in a place that is the least uncomfortable, smoke from a small fire being quite sufficient to make many of them take to the wing. Chlorine being a heavy gas, it would be necessary to generate an immense amount of it before reaching the bats hanging on the branches, even if the conformity of the ground rendered such an attempt feasible; moreover it has a most destructive effect upon foliage.

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* More Natural History Essays. Renshaw.

Sulphur dioxide gas and arsenic trichloride must be ruled out of court for the same reason as chlorine, viz., the volume to be generated before reaching the bats would have to be enormous, even if the bats remained still, and the possible subsequent action of this larger volume of gas upon animals and foliage in the neighbourhood would have to be considered.

Hydrocyanic acid gas, when inhaled pure, is very quickly fatal. Even when diluted with air, if breathed for any length of time, it produces death, and its use in fumigating is well known. It is lighter than air. A preliminary test was made of its use in the bat-camp by fixing an enamelled billy-can, containing sulphuric acid, in a small tree in which bats had been observed. A packet of potassium cyanide was so arranged that it could be dropped at will into the billy-can in order to generate the gas. When the apparatus was being fixed up in the tree the bats flew away, but later a few returned. Nothing happened to the bats when the gas was generated, the dilution of the gas by air being too great and its passage upwards being apparently too rapid to affect the bats which hung some 10 feet above, but not directly over the generating apparatus. A second experiment was tried of pushing up a billy-can containing sulphuric acid into a low tree on the end of a long pole. When a few bats came upon the tree a packet of potassium cyanide upon the end of a long pole was dropped into the gas. As in the previous experiment the gas generated did not affect the bats. Both in this and the preceding experiment the bats were easily disturbed and flew away when the simple apparatus was being fixed up in the tree. A test was therefore made as to the feasibility of generating the hydrocyanic acid gas upon the ground level. A light breeze was blowing overhead; a small fire was thereupon lighted in the bush to determine the direction of the wind at the ground level. In the course of a few minutes the smoke of the fire had travelled first north, then east, then south. These varying air-currents were doubtless produced by the configuration and conformation of the bush, but their presence demonstrated that the generation of hydrocyanic acid gas in any quantity at the ground level could not be carried on without danger to the operator.

The question of using hydrocyanic acid gas condensed in cylinders and leading it upwards towards the foxes in a light tube remains. It may be said at once that the danger that would be incurred in preparing the gas under pressure and in subsequently handling it, would be too great to render this method practicable.

Considerable misapprehension exists as to the state of the bats in a camp. Occasionally they may be found hanging in clusters, and it has been stated that if those hanging to the main support are injured, the rest fall to the ground in a clump. Sometimes this may be the case, though general experience is that immediately a bat finds itself falling it spreads its wings and glides, or begins to fly.

At Wauchope there were many thousands of flying foxes, some hanging in trees, 20 or 30 feet from the ground, others in trees 100 feet or more from the ground. All of them were hanging singly, and very few of them appeared to be asleep. Most of them fanned themselves continuously whilst hanging, with one wing, or crept along the branches to molest their nearest neighbour. The camp was a scene of incessant wrangling and contention. Occasionally, without any apparent reason, a shrill cry would be given, and a flock of bats would leave one part of the camp for another, there to be met with opposition from the tenants of the branches at every attempt to land; thus while some parts of the camp were comparatively quiet, in others there was continuous noise, biting, and fighting.

A peculiar, somewhat unpleasant odour pervaded the camp. About half-past 7 o'clock at night all the bats in the camp became restless, and commenced to make short circular flights above the trees; they then set off in a particular direction in a continuous stream, flying with a slow, flapping, measured movement. About half-past 9 Mr. Burrows and the writer, carrying lanterns, went through the bush to the camp. It was practically empty—hardly a fox was to be heard. A gun was fired, and hardly a flutter of wings was audible.

Taking into consideration the general nervousness of the bats in the day-time, and the difficulty of manipulating poisonous gases in such a way as to be effective, it may, I think, be stated that the proposition to destroy flying foxes by means of poisonous gas is not practicable.

The method of destruction that has generally been adopted, has been to organise a "battue." This method has several objections: All sorts of fire-arms are brought for the fray; it is not easy to find a leader capable of organising the attack, since not being known to everybody, his directions may not be followed, and it is not easy to control isolated parties in the bush. A shot-gun is fired, the foxes in the camp are startled and disturbed, and the rest of the day may be spent in much expenditure of ammunition with little result.

If only rifles are used, it is comparatively easy, since they make little noise, to pick off fox after fox with little disturbance. If ordinary bullets are used, very few foxes will reach the ground, since they spread out their wings when wounded and cling most tenaciously to any object in falling. If hollow-nosed bullets are used, the explosive effect produced on hitting will bring down many more foxes. There is no doubt that a few men using small ·22 rifles with silencers and explosive bullets could work terrific destruction in a camp in a few days. The payment of an adequate fee per scalp would no doubt induce them to undertake the work, and would result in a considerable reduction of the flying-fox pest.

Little seems to be definitely known as to the breeding habits of the flying fox. At Wauchope, in February, many of the females had half-grown young; no young were found *in utero* among the females that were shot. In a camp at Dural in November, 1915, it was noted that each mother had one young one attached to her breast; at Gosford it was noted that many had twins. Mr. H. L. White says that the young bat makes its appearance in the spring. There are two well-developed mammæ, and the little fox clings tightly with its claws to the fur of the mother just underneath the wing. From the above it would appear that the greatest chance of destroying mother and offspring is to attack the camps as early in the season as possible.

I am indebted to Mr. Burrows of the Agricultural Department; to Inspector A. T. Hunter, of Castle Hill; to Inspector O. Brooks, of Gosford; and to Mr. C. Scrivener, of Mount Irvine, for much information in regard to flying foxes, particularly in regard to methods of keeping them out of orchards. The method of poisoning them by means of strychnine has already been described in the *Agricultural Gazette*.* The method seems to be most effectual when a young sapling, with the poisoned fruit on, is tied to a pole, and the latter secured to an orchard tree in such a manner that the sapling is 2 or 3 feet above it, *early in the season*. The use of poison early in the season has two recommendations. Foxes are more likely to be poisoned when ripe fruit is not over-plentiful, and wild animals are particularly quick to note spots where their fellow creatures have met with disaster.

Another view of the Flying Fox Camp at Wauchope.

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* *Agricultural Gazette*, vol. xxv, page 551, vol. xxvii, page 911.

One of the best means of frightening foxes is to erect poles reaching about 6 feet above the orchard trees. From pole to pole the thinnest barbed wire obtainable is stretched, running in a direction at right angles to the way the foxes usually enter the orchard from their camp. The foxes hit the wires and damage their wings, and this frightens them away even more than gun-fire. The method is somewhat expensive, but seems to be the most effective. Mr. H. L. White,* of Belltrees, Scone, says that flying foxes drink on the wing like swallows, many of them meeting their death on the barbed wire stretched over streams as fence crossings. He also records that the flying-fox feeds upon the bloom of the white box (*Eucalyptus* sp.), the buds of the weeping willow, and the bark of the young twigs of the same tree.

At Tuggerah old fishing-nets are sometimes suspended on poles and loosely stretched across the orchard. Foxes flying into them, or attaching themselves to them, often seem unable to free themselves and become tangled-up inextricably.

Of the enemies of the flying fox the iguana may be recorded. A large specimen of this lizard was shot at Wauchope, which contained in its stomach a flying fox that had been swallowed almost whole.

Though the possibility of successfully starting a fatal epidemic in a fox camp by means of a microbe seems remote, the writer would be glad to hear of any case where an outbreak of disease in a flying-fox camp is noted.

There is much difficulty in obtaining photographs of flying foxes in their haunts on account of the thick bush, without the use of a telephoto lens. The two illustrations which accompany this article were made from photographs taken at Wauchope with an ordinary camera. They serve to illustrate the manner in which the foxes hang from the branches, looking something like large dead leaves, and the apparent impossibility of successfully dealing with them by means of poisonous gas.

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* *The Australasian*, Oct. 28th, 1916.

WINTER SCHOOLS FOR FARMERS AND POULTRY FARMERS.

ARRANGEMENTS have been made to hold the usual Winter Schools for farmers at the Hawkesbury Agricultural College, and the course will extend from Tuesday, 19th June, to Saturday, 14th July, next.

These schools are provided at the slack period of the year for busy farmers, stockowners and poultry-raisers of both sexes who can devote only a limited time to study and intensive practical instruction, and such as attend these schools are afforded an opportunity to acquire the greatest amount of directly useful information in the shortest time.

A fee of £2 2s. is charged for the course, and this includes board and lodging for the whole period. Reduced fares on the railway will be issued, and concessions on current rates are made by the North Coast Steam Navigation Company, Limited.

Application for entrance must be forwarded to the Under Secretary and Director, Department of Agriculture, Sydney, not later than the 31st May.

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

A Native Dock (*Rumex Brownii* Campd.).

(Family : POLYGONACEÆ.)

Popular description.—A dock. Stems sparingly or much branched, 1 to 2 feet high. Leaves stalked, the stem-leaves (cauline) and root-leaves (radical) similar, a span long, narrow lanceolate, and with a more or less spear-headed base. The margin flat or crisped, and the point of the leaf blunt or tapering.

A native weed.—In the early days this weed was looked upon as an escape from cultivation, and it was reserved for a French specialist in docks to point out that the contrary was the case. He does not seem to have written any other work than the one of which the title is as follows :—

> "Monographie des Rumex, précédée de quelques vues générales sur la famille des Polygonées." By François Campdera, Paris, 1819. Quarto, 169 pages and 3 plates. It is rare, and does not appear to be in any Sydney library.

Rumex Brownii was named after the celebrated botanist, Robert Brown, who was in New South Wales from 1800 to 1804.

This affords an example of the not very lengthy list of native plants which have been classed as weeds. As with some animals, so with plants, the list may be expected to be increased as the cultivator extends his operations. Some native plants accept the fiat of extermination uncomplainingly, others, such as this, struggle hard for existence.

Rhubarb and buckwheat are useful members of the family to which the docks belong.

Botanical description.—A perennial, with a thick rhizome, and erect simple or slightly-branched stems of 1 to 2 feet. Radical and lower leaves on long petioles, often cordate or hastate, oblong and obtuse : the stem-leaves mostly lanceolate and acute, the floral ones reduced to small bracts or quite deficient. Clusters remote, many-flowered, forming long simple or slightly-branched racemes, the fruiting pedicles slender or thick, 1 to 3 lines long. Inner segments of the fruiting perianth broadly triangular, 1½ to 2 lines long, bordered on each side by four to six bristles, much hooked or almost involute at the end, the midrib prominent, but without any distinct tubercle (B.Fl. v, 263.)

Habitat.—This dock was originally described from Port Jackson specimens, but since then it has been found in every State of the Commonwealth, chiefly in the coastal and tableland areas. It is not known from the tropics.

Like other docks, its home is sour, undrained land. Docks are exterminated by draining the land, by manuring it, by deep cutting of the roots, and by cultivation generally which interferes with their growth, drying up their roots and exposing them to the sun. This dock yields a large quantity of seed, which is carried about by the hooked fruits which attach themselves to the hides and fleeces of animals, so that seed should not be allowed to form. In common with other docks, it is spread a good deal with cereal and other seeds. Farmers should never let it go past the flowering stage.

EXPLANATION OF PLATE.

Plant very much reduced in size.

1. A flower, opened out. Note the perianth of six segments, the six stamens, and the three feathery stigmas.
2. A flower not fully expanded. Note the three narrower inner perianth segments, which enlarge after flowering.
3. Frontal view of the enlarged triangular fruiting perianth, showing the hooked bristles and the midrib without a prominent tubercle. (The photographic process does not bring out the reticulated appearance very clearly.)

4 and 5. The nut, which is triangular in section.

Proliferous Pink (*Dianthus prolifer* L.).

(Family: CARYOPHYLLACEÆ.)

Botanical description.—A stiff, erect, glabrous annual. Leaves few, narrow. Flowers small, pink, clustered in compact terminal heads. Calyx tubular, concealed by broad, dry, shining imbricated scales. Styles 2. Capsule cylindrical, containing many flat black seeds.

Notes.—One or two flowers in a head are only in perfection at once, and they are so tender and short-lived that they cannot be said to be decorative, although the plant has a grace of its own. It is destitute of the usual pink odour. As a rule the Pink Family is harmless to man and beast; an exception is the Corn Cockle, which is referred to in the *Gazette*, vol. xxvii, page 31; the seed when ground up with wheat poisons the flour.

Habitat.—It is a native of Britain and other European countries, and also Western Asia.

It prefers dry pastures. In New South Wales, while it is rather common in light sandy, grassy land in the Sydney district, it seems to have been most recorded from the Southern Tableland, but it extends also to Queensland (*e.g.*, Toowoomba). It is found in all the other States.

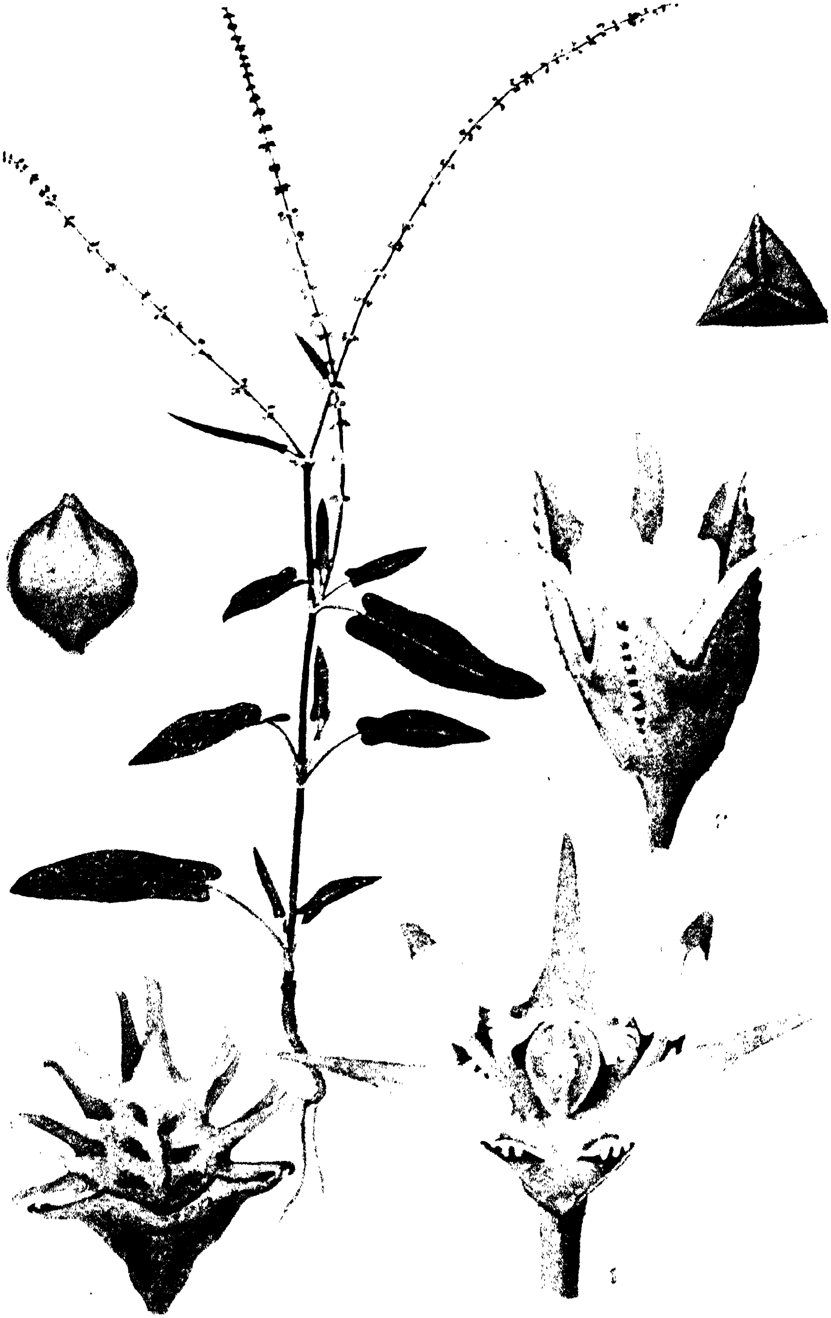
Sowerby, over a century ago, said that it grows on a gravelly, or rather marly soil, and has not been found in more than three or four places in England.

EXPLANATION OF PLATE.

Two plants, much reduced.

1. Compact, clustered head of flowers, with a cylindrical capsule just beginning to ripen.
2. A separate flower. Note the notched petals, and the two styles.
3. Showing flowers surrounded by membranous scales.
4. A flower opened out vertically. The petals with long, pale-coloured claws.
5. Calyx-tube showing furrows; it has been removed from the outside of No. 4. (The photographic process does not bring out the details very well.)

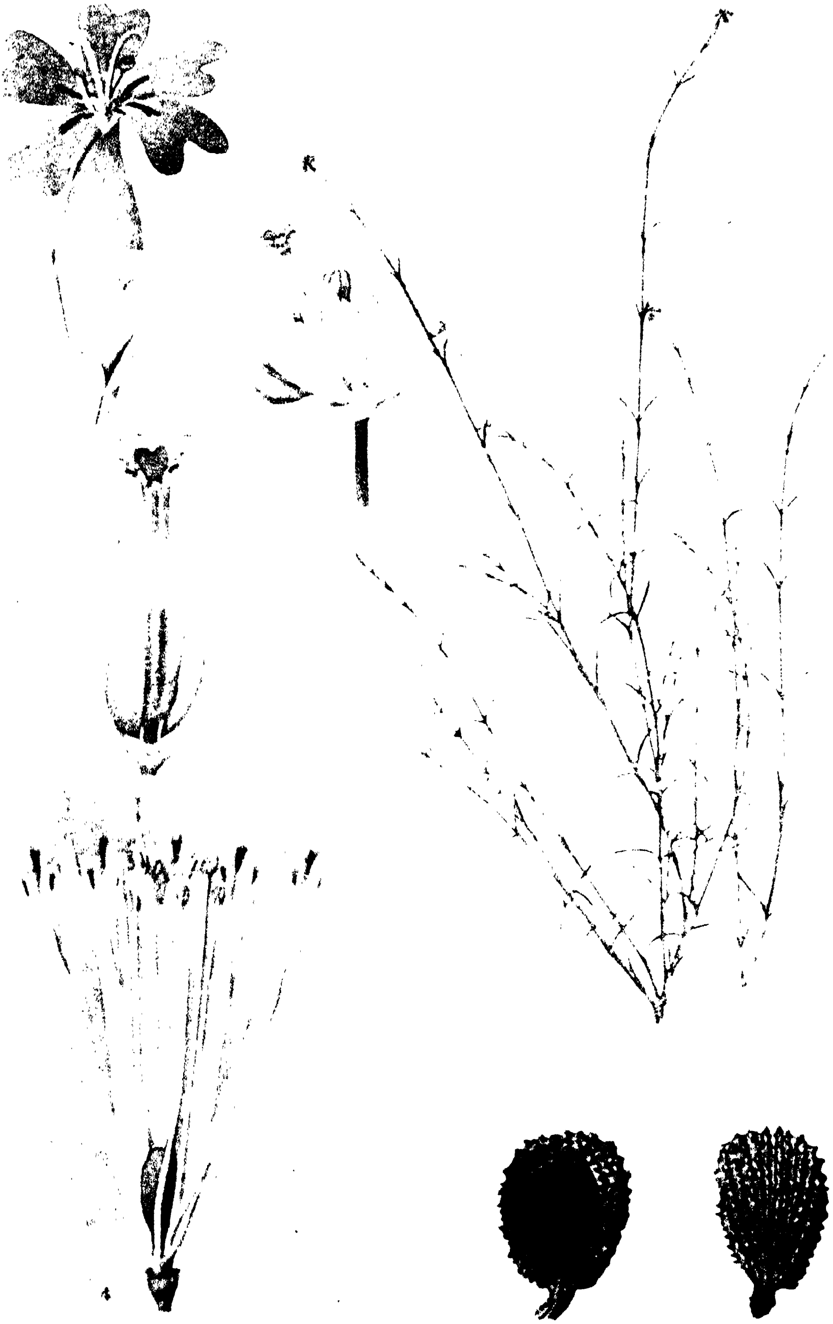
6 and 7. Front and back views of the ribbed, tuberculate shell-like seeds.



WEEDS OF NEW SOUTH WALES.

A NATIVE "DOCK."

Rumex Brownii Campd.



WEEDS OF NEW SOUTH WALES.

PROLIFEROUS PINK.

Dianthus prolifer L.

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1916.

LOWER NORTH COAST.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

POTATO experiments were carried out in co-operation with the following farmers on the Lower North Coast during 1916:—

Mr. J. W. Smith, Wauchope.
Mr. A. McM. Singleton, Tinonee.

In general, the season commenced very dry, but afterwards it turned out too wet for the best results.

The Wauchope Plots.

Planting took place on 23rd August under somewhat unfavourable conditions, the soil being rather too moist. Germination, however, was very good, and a very good stand resulted. The weather then set in very dry, only 86 points of rain being recorded in the month following planting. The unmanured rows were easily distinguishable during growth, having very poor growth of "tops" compared with the manured rows. The plot made fairly good growth during October, but was attacked by the spotted ladybird beetles, which completely riddled the leaves, and must have considerably lowered the yield of what promised to be a rather good crop. The good rainfall during October, combined with the humid weather, also favoured the development of blight, but beyond a slight trace on the leaves this was of no consequence, being most likely checked by dry weather, which set in during November. When harvested, the tubers proved free from any sign of blight, but none of the varieties attained any worthy size owing to the depredations of the insects on the leaves.

The following are the yields:—

Variety.	Manure per acre.	Yield per acre.				Percentage of marketable tubers.
		tons	cwt.	qrs.	lb.	
Manhattan	2 cwt. superphosphate	3	4	3	8	93
,,	2½ cwt. P5	3	7	1	16	92
,,	No manure	2	3	1	16	89
,,	3 cwt. P4	3	10	0	20	91
Up-to-Date	,,	3	10	2	24	82
Satisfaction	,,	2	9	3	8	85
Carman No. 1	,,	2	17	1	8	88
Early Manistee	,,	3	2	2	20	90

The rainfall during the growth was:—September, 86 points; October, 315; November, 169; December, 868.

Most of the December rainfall, of course, came too late to affect the growth, and the effective rainfall might be taken to be that of the first three months, totalling 510 points.

The outstanding feature of the result is the poor comparative yield of the unmanured plot, and this in a season in which the rainfall was somewhat sparse. In such a season, the increase of over 1 ton of tubers (about 50 per cent.), due to manuring, must be considered to be highly satisfactory. It must be recognised that the Hastings River soils cannot compare with those of the Manning River for fertility, and that the use of manures on the former soils is likely to be of greater benefit.

With regard to the varieties, it is to be noted that Up-to-Date and Manhattan maintained their reputation as good yielding varieties in this district, but that the former has a lower percentage of marketable tubers. Manhattan has a fairly high percentage in this respect; but for evenness of size, Carman and Manistee, particularly the former, surpassed all the others. In spite of its reputation for good yield, Manhattan is not popular, on account of its poor eating quality, and, in fact, is very hard to sell locally. A poor quality potato does not improve when grown on stiffer or more clayey soils, and it seems essential that a variety suitable for this locality should be of good quality, on account of the somewhat stiffer nature of the soils. The other varieties tested in this experiment are of satisfactory quality, Up-to-Date being one of the best.

The Tinonee Plots.

These plots were sown on 28th August, and, as in the former case, the following month was very dry, only 17 points of rain being recorded in September. The stand was very good, and the growth fairly satisfactory, but with a high October rainfall and weather conditions favourable, blight made its appearance in the crop, being most conspicuous on the low-lying parts of the ground—even on very small patches, where the level was only a few inches below the surrounding surface. At the flowering stage, Manhattan seemed to be the least affected of any variety by the disease. The continuance of conditions favourable to blight during November made it certain that the tubers could not escape being affected, and the tubers were harvested on 2nd December while the skins were not yet firm, in order to try to save them from the blight as much as possible. As it was, there was a fair proportion of the tubers already rotted, and the yields were considerably affected. The following are the results:—

Variety.	Manure per acre.	Yield per acre.			
		tons	cwt.	qrs.	lb.
Manhattan	2 cwt. superphosphate ...	3	11	1	25
,, ...	2½ cwt. P5	3	8	0	6
,, ...	No manure	3	12	2	13
,, ...	3 cwt. P4	3	14	1	8
Up-to-Date	No manure	2	17	1	18
Satisfaction	,, ...	3	2	3	19
Carman No. 1	,, ...	2	5	2	14
Early Manistee	,, ...	3	8	1	20

The rainfall during growth was:—September, 17 points; October, 418; November, 345. Total, 780 points.

The results of the variety trial are not truly comparative, owing to the outbreak of blight, but the comparatively small difference between the manured and unmanured plots of Manhattan is worthy of note.

The fertilisers used in these experiments were made up as follows:—

P4.—4 cwt. sulphate of ammonia, 13 cwt. superphosphate, 3 cwt. sulphate of potash.

P5.—16 cwt. superphosphate, 4 cwt. sulphate of potash.

DRY COPPER CARBONATE TREATMENT FOR BUNT.

IN connection with the article in the March issue, a correspondent has asked how the dry copper carbonate is mixed with wheat, and whether it would be sufficient to add the copper carbonate to the wheat in the seed drill and trust to it getting mixed in passing through the drill.

In reply Mr. H. Ross, Chief Inspector, stated that while the dry copper carbonate treatment of seed wheat for the prevention of bunt has in the experiments so far proved successful, it must be remembered that these tests have not been carried out on a large scale, and farmers are advised, for the present at any rate, to continue with the treatment recommended for the past few years, viz., bluestone and limewater.

If the writer wished to try a small area as an experiment he should mix 2 oz. copper carbonate thoroughly with 1 bushel of wheat. The success of this treatment depends to a large extent upon this thorough mixing. It is not sufficient to sprinkle 2 oz. over each bushel of wheat in the grain box of the drill, as this will not have the desired effect.

So far there is no machinery on the market for thoroughly mixing the wheat and the dry copper carbonate, but should this treatment eventually prove more successful than the bluestone and limewater, and should it become generally adopted throughout the State, there will be little difficulty experienced in making suitable machinery for the treatment.

THE DESTRUCTION OF MICE.

IN answer to a recent inquiry on this subject, Mr. W. W. Froggatt, F.L.S., Government Entomologist, stated that the method to be adopted of course depends on where the mice are located. If the food they are attacking can be shut up or placed beyond their reach, the mice can be poisoned with strychnine mixed with flour and placed in suitable vessels such as saucers. If out in the open, a kerosene tin half full of water having the top cut off, sunk level with the ground, makes a very effective trap when placed where the mice are sheltering or congregating. Cases are known where such traps have been completely filled in a night.

Where the mice are not so plentiful an attractive bait placed on the bottom of the tin (no water being left in the tin) will often catch great numbers.

In hay or wheat stacks fumigation would be most effective, provided the stacks are not too large.

Potato Experiments, 1916.

GRAFTON EXPERIMENT FARM.

K. B. MACPHERSON, Experimentalist.

[The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a few years. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.]

THE land selected for the experiments was portion of No. 7 flat, where pigs had been allowed to roam for a number of years. It is composed of clayey alluvial, very fertile soil, well charged with organic matter, fairly even in character. It was previously under paspalum.

Early preparation was not neglected, and the ground was first broken with the mould-board plough to a depth of 8 inches after the heavy autumn rains. It was allowed to remain in that state for several weeks, then harrowed both ways, disced, and harrowed again. The land received its second ploughing in July, followed by frequent harrowings, and cultivated with the spring-tooth cultivator. The final and very shallow ploughing was given just previous to planting, after which it was harrowed down immediately both ways.

The paddock was marked off into plots having four rows, each 4 links apart, separated by 4 links from adjacent plots, and 10 links between each experiment, with a headland of 12 feet at both ends, and buffer plots of two rows on either side. The plots were 2·50 chains long and 16 links wide, so that each covered one twenty-fifth of an acre.

The Season.

The record drought of 1915 was succeeded by one of the most promising seasons yet experienced in the district. Normally January to April is the rainy season, and during those four months 23·04 inches fell; after that the monthly total gradually receded until the minimum of 64 points for July was reached. August was responsible for 1·59 inches, and this was followed by regular and rising monthly totals until November, when no less than 9·62 inches fell. Further rains in December seriously delayed work, and made harvesting operations extremely difficult. Had the potatoes not been hilled, indeed, it is highly probable that quite 50 per cent. would have rotted, and as it was, several fine samples were spoilt.

The following is the monthly rainfall for the past three years:—

	1914.	1915.	1916.	1916.
	inches.	inches.	inches.	No. of days.
January	3·17	3·23	4·64	7
February	2·14	2·28	7·69	10
March	5·31	·64	2·45	6
April	·36	2·63	8·26	9
May...	4·31	2·79	3·05	5
June	4·50	·15	1·47	7
July...	3·22	·27	·64	3
August	·74	1·31	1·24	5
September	·80	1·28	1·41	9
October	6·58	·20	1·97	9
November	2·32	·25	9·62	12
December	6·35	1·36	2·57*	8

* To 11th December, 1916, only.

It will be seen from the above table that over 13 inches of rain fell on twenty-seven days, spread over a period of two and a half months.

The Seed.

The seed was obtained from various sources, mostly from large tubers of good, sound quality, free from disease, fairly uniform in size and condition of sprouting. With the exception of Early Rose, the varieties were true to type. The eyes were large and vigorous, and the skin very firm and difficult to rub off. The tubers, when cut and placed together, adhered closely, indicative of a high percentage of starch.

Manhattan, being a general favourite, and a recognised heavy yielder in this district, was selected for Experiments Nos. 2, 3, and 4, and for all check and buffer plots in Experiment No. 1 (variety trial).

For the depth of planting and variety trials about 8 cwt. of seed per acre was used, for the manurial experiment 10 cwt. per acre, and for the "size of set" trial between 7 cwt. and 12 cwt.

Experiment No. 1 was ploughed in on the 10th August, No. 2 on the 9th, No. 3 on the 8th, and No. 4 on the 14th. Save in the case of Experiment No. 3, the sets were dropped every 15 inches at a depth of 5 inches, immediately after the plough, and in every third furrow, at a distance of 4 links apart. The sets were placed cut side down on the slope of the furrow, and covered shortly after.

In the case of Experiment No. 3 (depth of planting), the different depths were obtained by raising or lowering the wheel as required.

Germination.

Variety Trial.—The germination could hardly be considered uniform, although very good throughout, Manhattan, Early Rose, Rector, and Brownell's Beauty showing up best.

Size of Set.—Excellent throughout, with the exception of plots 4 and 5, which appeared patchy in places; plots 6 and 8 were specially good.

Depth of Planting.—Fairly uniform throughout, with the exception of plot 6.

Manurial Experiment.—Uniform and excellent throughout.

Shortly before the young shoots made their appearance, the harrows were run over the ground for the purpose of killing young weed growth. This left a nice loose surface, through which the plants could penetrate easily. When the rows could be picked out, the scuffler and spring-tooth cultivator were employed at frequent intervals. The experiments were hilled on the 11th October with the mould-board plough; this helped to prevent attacks from the potato moth, which was again somewhat troublesome this year.

The experiments were sprayed with Bordeaux mixture on the 17th October.

Notes on Growth.

Variety Trial.—The "check" plots of Manhattan showed up remarkably well from beginning to end, and easily maintained an already established reputation. Most of the other plots presented a very healthy appearance, and made vigorous growth, especially Rector and Plunkett, the first mentioned being quite two weeks earlier than the other varieties.

Size of Set.—Most of the plots made satisfactory growth; plots 2, 3, 6, and 8 were always vigorous.

Depth of Planting.—This experiment was very irregular. Plot 6 always appeared backward, while plots 1 to 4, which were on slightly lower ground, suffered greatly from the excessive rainfall.

Manurial Experiment.—Very little difference was noticeable in any of the plots for a considerable time, but eventually plots 2, 3, 5, 8, and 9 made much better growth, and looked fresher.

Harvesting.

Experiment No. 2 was harvested on the 28th November. After that rainy conditions seriously hampered operations, and several days passed before Experiment No. 3 could be touched, while Experiment No. 4, sown much later, had to stand over until the 18th December.

In the case of Experiment No. 1, the varieties were harvested as they reached maturity.

From each plot one twenty-fifth of an acre was utilised for the estimation of yields. The tubers were ploughed out with a single-furrow mould-board plough.

The potatoes were weighed in the field, and the results obtained, together with the actual and percentage yields, are given in the various tables.

Experiment No. 1.—Variety Trial.

Object.—To ascertain the most suitable varieties of potatoes to grow from a commercial standpoint in the Clarence River district.

Varieties Tested.—Exclusive of the check variety, six varieties were tried in this experiment. Vermont Gold Coin, Beauty of Hebron, Bliss's Triumph, Coronation, and Queen of the Valley were unobtainable.

The varieties tested may be grouped into the following classes as regards maturity:—

Early Varieties.—Rector, Early Rose, and Up-to-date.

Mid-season.—Satisfaction, Manhattan, and Plunkett.

TABLE I.—Showing Results of Potato Variety Trial, 1916.

Area harvested, one twenty-fifth of an acre.

No. of Plots.	Variety.	Yield per plot.	Yield per acre.				Percentage Yield.
		lb.	tons	cwt.	qrs.	lb.	
1 (*check*)	Manhattan	403	4	9	3	23	100·
2	Up-to-Date	446	4	19	2	6	98·7
3	Satisfaction	307	3	8	2	3	61·3
4 (*check*)	Manhattan	550	6	2	3	2	100·
5	Plunkett	336	3	15	0	0	62·7
6	Early Rose	366	4	1	2	22	70·1
7 (*check*)	Manhattan	508	6	3	0	24	100·
8	Rector	Failed (rotted)	.. ..				...
9	Brownell's Beauty	,, ,,	....				...
10 (*check*)	Manhattan	356	3	10	2	4	100·

Comments.—Although Manhattan has not the desirable flavour that Satisfaction has, this drawback is more than compensated for by heavy yields, and in this respect the variety has maintained its reputation, already well known in this district. Early Rose and Up-to-Date have done well, but the tubers were mostly small, and required a lot of grading. Plots 8 and 9, which appeared so promising all through, were spoilt by the heavy and continuous rains.

Experiment No. 2.—Size of Set.

Object.—To ascertain the most economical size of set to employ in planting.

TABLE II.—Showing Results of Size of Set Experiment.

No. of Plot.	Size of set.	Yield per plot.	Yield per acre.				Percentage Yield.
		lb.	tons	cwt.	qrs.	lb.	
1 (*check*)	Medium sets in quarters	329	3	13	1	21	100·
2	Large whole sets	594	6	12	2	10	198·0
3	Medium whole sets	597	6	13	1	1	220·0
4 (*check*)	Medium sets in quarters	242	2	14	0	2	100·
5	Small whole sets	458	5	2	0	26	154·7
6	Large, cut once	735	8	4	0	7	210·0
7 (*check*)	Medium sets in quarters	404	4	10	0	20	100·
8	Medium, cut twice	792	8	17	2	20	195·1
9	Small, cut once	528	5	17	3	12	120·9
10 (*check*)	Medium sets in quarters	410	4	11	2	2	100·

Comments.—All the large sets appear to have given the best results, but as small whole or cut sets would be the most economical, it may be said plots 5 and 9 have done very well indeed.

Experiment No. 3.—Depth of Planting Trial.

TABLE III.—Showing Results of Depth of Planting Experiment.

No. of Plot.		Method of Planting.	Yield per plot.	Yield per acre.				Percentage Yield.
			lb.	tons	cwt.	qrs.	lb.	
1	(*check*)	Sets 5 inches deep... ...	274	3	1	0	18	100·
2	...	,, 3 ,, ...	332	3	14	0	12	126·1
3	...	,, 4 ,, ...	341	3	16	0	13	126·3
4	(*check*)	,, 5 ,, ...	268	2	1	3	24	100·
5	..	,, 6 ,, ...	405	4	10	1	17	133·2
6	...	,, 7 ,, ...	298	3	6	2	2	87·6
7	(*check*)	,, 5 ,, ...	337	4	3	3	0	100·

Comments.—Plots 1 to 4 were bady affected by the wet weather, so that it would be unfair to draw comparisons.

Experiment No. 4.—Manurial Experiment.

TABLE IV.—Showing Results of Manurial Experiment.

No. of Plot.		Fertiliser per acre.	Yield per plot.	Yield per acre.				Percentage Yield.
			lb.	tons	cwt.	qrs.	lb.	
1	(*check*)	Unmanured...	415	4	12	2	15	100·
2	...	2 cwt. superphosphate	560	6	5	0	0	125·6
3	...	*P5 2¼ cwt....	580	6	9	1	24	121·6
4	(*check*)	Unmanured...	508	5	13	1	16	100·
5	...	*P4 3 cwt.	561	6	5	0	25	117·1
6	...	Nitrate of lime 3 cwt.	527	5	17	2	15	117·1
7	(*check*)	Unmanured...	421	4	13	3	25	100·
8	...	Poudrette 5 cwt.	553	6	4	1	9	133·3
9	...	Poudrette 5 cwt., and superphosphate 1¼ cwt.	596	6	13	0	4	145·7
10	(*check*)	Unmanured...	403	4	9	3	23	100·

*** The composition of these mixtures is as follows:—P4 Mixture—4 cwt. sulphate of ammonia, 13 cwt. superphosphate, 3 cwt. sulphate of potash. P5 Mixture—16 cwt. superphosphate, 4 cwt. sulphate of potash.**

Comments.—This experiment has proved beyond all doubt that manuring increases the yield of potatoes. The other three experiments were planted in new ground, while this was sown on land that has been cropped for a number of years. Plots 2, 3, 8, and 9 have given very creditable returns, and show a substantial increase over all check plots (unmanured).

Egg-laying Tests at Hawkesbury Agricultural College.

FIFTEENTH YEAR'S RESULTS, 1916-17.

G. D. ROSS, Organising Secretary.

Comments on the Results.

JAMES HADLINGTON, Poultry Expert.

THE outstanding feature of the egg-laying competitions conducted at Hawkesbury Agricultural College, and which terminated on Saturday, the 31st of March, 1917, was the general excellence of the results and the eclipsing of previous world's records of laying of individual hens. The fact that after fifteen years' continuous work in this competitive field of poultry culture the mean and maximum production was well ahead of previous years, is indisputable evidence of progress.

The competition was the first conducted entirely by means of single pens. Altogether 420 pens were erected for this purpose, and an additional 120 pens have since been erected with a view to testing the hens carried over for the second year.

The value of the information obtained during the past twelve months not only warrants the continuation of this class of work, but also justifies extension in certain directions when funds permit.

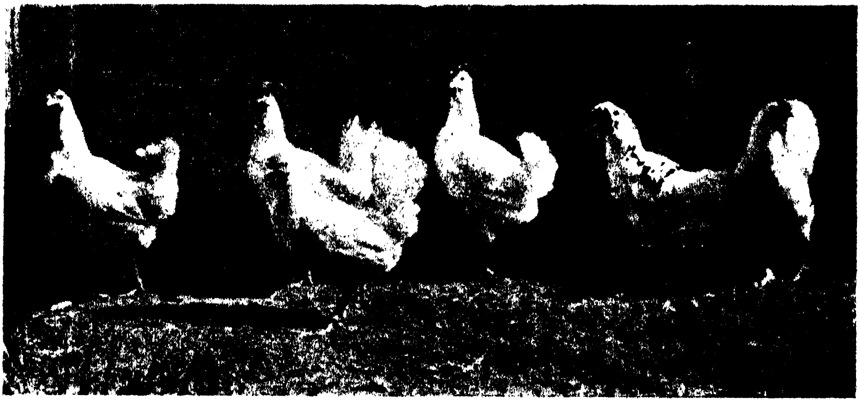
In the group system individual records were impossible, and probably many hens which were actually excellent layers have been regarded as moderate owing to the failure of a few hens in the group to put up a reasonable score. Now every hen depends entirely on her own merits, and when returned to her owner must provide a valuable object lesson. Breeders will be able to recognise the types that may be regarded as egg machines, moderate layers, and culls.

The fact that several individual hens have put up such excellent records as are referred to later is extremely pleasing, but the outstanding feature is the excellent advance made in the averages of all sections. A question that may well be asked is, what is the cause of this increase? Probably there are several factors contributing to it. It is certainly easier to devote more individual attention to birds in single pens than in the larger yards containing groups, and this must certainly have beneficial results, but it is agreed that the excellent educational work carried on by the Poultry Expert of the Department is bearing fruit, and poultry farmers are being educated to select the proper types both for breeding and laying. The effect of this improvement must be felt throughout the whole State, and justifies the money spent upon this work by the Department.

The testing of such a number of birds in single pens is certain to provide abnormalities which, although considered possible, have always been regarded with more or less doubt. For example, in May, 1916, Mrs. Jobling's Black Orpington hen No. 415 laid two normal eggs on the 5th, 8th, 10th, and 15th. In addition, she laid on the preceding and succeeding days, which is possibly the best performance in this direction of which there is any definite record.

Second-year Hens.

The highest previous score for the two years' test was 2,634 eggs, and for the second year 1,213 eggs, while the highest value for the two years amounted to £14 5s. 2d. These figures have now been eclipsed by the excellent performance of Mr. T. E. Jarman's hens with a tally of 2,647 eggs, of which 1,231 were laid in the second year, and a total value of £15 0s. 11¾d. Other performances well worthy of mention are Mrs. W. V. Hopkins' pen with 1,186 eggs, and Mr. M. A. White's pen with 1,180 eggs for the second year. The averages also for the 120 birds in this section were higher in both first and second year than any previously recorded.



Mr. T. E. Jarman's White Leghorns.
Greatest number of eggs (2,647) in two years.

First-year Section.

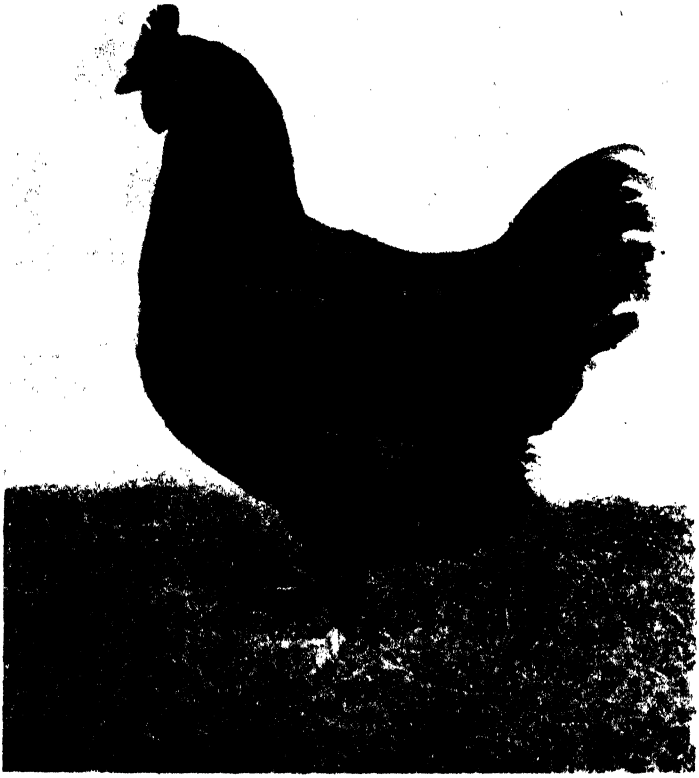
SECTION A (LIGHT BREEDS).

In this section the total aggregate is excellent, and points to the high and improving quality of practically the whole of the competing pens. The average per bird was 216 eggs, as compared with the previous highest tally of 192 eggs per hen, while the profit over cost of feed, viz., 16s. 10¾d. per bird, is an increase of 1s. 10¾d.

The highest total for the year in this section is that of Mr. Weaver's group of White Leghorns, namely, 1,526 eggs of a value of £8 11s. 11¾d. This tally, which is an average of 254 eggs per bird, is only fifteen eggs below that of the highest score which was recorded during 1914–15. Only two groups failed to reach the total of 1,000, which shows a considerable advance on previous competitions.

Other scores of merit are those put up by the birds of Messrs. S. H. K. Champion (1,494 eggs) and W. F. Elliott (1,493 eggs).

Several individual hens put up very fine performances, viz :—Mr. W. H. Appleyard's (308), Mrs F. Skinner's (300), and Mr. J. M. Weaver's (297). The first bird has exceeded the world's record, but a higher total has been made by one hen in Section B.



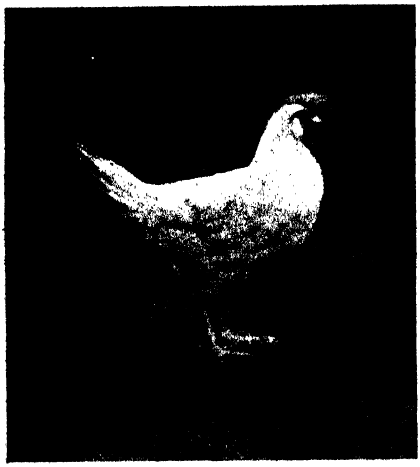
Mr. P. C. McDonnell's Black Orpington Hen
Which put up a world's record of 312 eggs in 365 days, and one of the pen which won First Prize in Section B with 1,479 eggs.

SECTION B (HEAVY BREEDS).

The highest total in this section is that of Mr. P. C. McDonnell's group of Black Orpingtons, namely 1,479 eggs of the value of £8 11s. 3d. His average of 246 eggs per bird is excellent, considering that he was unfortunate enough to lose one bird in December after she had laid 135 eggs. One of his birds has established a world's record, the previous highest authentic score being 303 eggs put up at Oregon Agricultural College, United States of America. Mr. McDonnell's bird No. 292 laid 312 eggs. The previous highest average for first-year hens was 192 eggs per bird. This figure has been equalled by the average for section "B," and when it is remembered that the latter section consists entirely of heavy breeds and that the previous average referred to was made by combined light and heavy breeds, the conclusion is that a considerable advance is being made with the latter.

Cost of Feeding.

The average cost of feeding the 540 birds in the three sections was 6s. 7d. per bird, as compared with 7s. 4d. last year. The profit over cost of feed was 14s. 11d. per hen.



Mr. J. M. Weaver's White Leghorn.
One of the group which laid 1,526 eggs in twelve months.
Winner of Section A.

Mr. S. H. K. Champion's White Leghorn.
One of the group which laid 1,494 eggs in twelve months.
Second Prize in Section A.

Mortality and Disease.

Under the rules governing Sections A and B, birds dying or becoming diseased during the first three months of the Competition may be replaced, but the scores of the replaced bird are struck out. After the period mentioned the birds dying cannot be replaced, but the scores are allowed to stand. It has been recognised that this involves a certain amount of hardship on the competitor who is unfortunate in losing a bird, and therefore it has been decided that, in future, additional prizes will be given, based upon averages. This will apply to groups of six and five birds. Where more than one bird is lost there is a possibility that the cause may be due to lack of stamina, and on that account these pens will not be eligible for average prizes.

The deaths and replacements were made up as follows :—

	Birds replaced.		Birds not replaced.
	Deaths.	Sickness.	Deaths.
Second Year	5	...	...
Section A	4	3	10
Section B	2	...	8

Weight of Eggs.

Regulation 3 governing the competition provides that any bird, the eggs from which do not attain an average weight of 24 oz. per dozen during the first four months or that does not lay during this period, shall be ineligible for a prize for that year. Under this regulation the following birds were disqualified :—

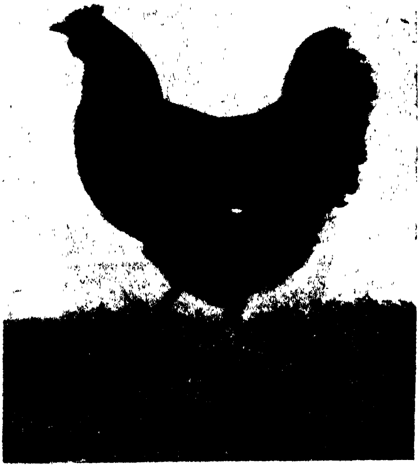
G. Speed ...	White Leghorns ...	Birds Nos. 15 and 16.
Miss N. Cupitt	„ ...	Bird No. 226.
H. W. Evans ...	Rhode Island Red...	Birds Nos. 159 and 162.
King & Watson	Black Orpington ...	Bird No. 281.
Mrs. C. Ferguson	„ ...	„ 400.
P. Kinney ...	„ ...	„ 412.

The Executive Committee.

The Committee controlling the Competition consisted of—

Messrs. H. W. Potts (Principal, Hawkesbury Agricultural College), James Hadlington (Poultry Expert, Department of Agriculture), A. L. Wyndham (Poultry Instructor, Hawkesbury Agricultural College), F. J. Brierley, J. F. Dalrymple, W. H. Forsyth (Competitors' Representatives), and G. D. Ross (Department of Agriculture) as Organising Secretary.

By the death of Mr. F. J. Brierley the Committee sustained a most regrettable loss. He was highly esteemed, both personally and as a member of the Committee. During his long association with the Competitions, extending over many years, he devoted himself to the work, and his advice was always of a practical and valuable nature.



Messrs. R. G. Christie & Son's Black Orpington.
One of the group which laid 1,356 eggs in twelve months.
Second Prize in Section B.

THE PRIZE WINNERS.

Two Years' Competition.

Greatest number of eggs in the second twelve months.—(1) T. F. Jarman, White Leghorn, 1,231 eggs, £3 ; (2) Mrs. W. V. Hopkins, Black Orpington, 1,186 eggs, £2 ; (3) M. A. White, White Leghorn, 1,180 eggs, £1 10s.

Greatest number of eggs in the two years.—(1) T. E. Jarman, White Leghorn, 2,647 eggs, £2 10s. ; (2) L. Graham, White Leghorn, 2,558 eggs, £1 10s. ; (3) J. King, Black Orpington, 2,532 eggs, £1.

Quarterly prizes :—

1st April to 30th June, 1916.—(1) T. E. Jarman, 241 eggs, £2 ; (2) R. Jobling, 236 eggs, £1 ; (3) J. King, 234 eggs, 10s.

1st July to 30th September, 1916.—(1) M. A. White, 386 eggs, £1 10s. ; (2) Mrs. W. V. Hopkins, 372 eggs, 15s. ; (3) T. G. Wilson, 357 eggs, 10s.

1st October to 31st December, 1916.—(1) M. A. White, 411 eggs, £1 10s. ; (2) Wharepaka Poultry Yards, 410 eggs, 15s. ; (3) L. Graham, 400 eggs, 10s.

1st January to 31st March, 1917.—(1) M. A. White, 322 eggs, £2 ; (2) Mrs. W. V. Hopkins, 281 eggs, £1 ; (3) S. Bertles, jun., 274 eggs, 10s.

Market value of eggs for two years.—(1) T. E. Jarman, £15 0s. 11¾d., £2 ; (2) and (3) L. Graham and J. King, æq., £14 4s. 11¾d., £2 10s. (divided).

Special prize of £5 (or trophy to value) for most eggs in two years, without replacement.—L. Graham, 2,558 eggs.

Mr. W. H. Appleyard's White Leghorn.
Laid 308 eggs in 365 days.

Mrs. F. Skinner's White Leghorn.
Laid 300 eggs in 365 days.

Fifteenth Annual Competition.

SECTION A.—LIGHT BREEDS.

Greatest number of eggs laid during twelve months (individual hens).—(1) W. H. Appleyard (bird No. 339), White Leghorn, 308 eggs, £2 10s. ; (2) Mrs. F. Skinner (bird No. 150), White Leghorn, 300 eggs, £2 ; (3) J. M. Weaver (bird No. 233), White Leghorn, 297 eggs, £1 10s. ; (4) E. Kennedy (bird No. 242), White Leghorn, 289 eggs, £1 ; (5) Mrs. Snowden (bird No. 381), White Leghorn, 288 eggs, 10s.

Greatest number of eggs laid during twelve months (groups of six birds).—(1) J. M. Weaver, White Leghorn, 1,526 eggs, £2 ; (2) S. H. K. Champion, White Leghorn, 1,494 eggs, £1 10s. ; (3) W. F. Elliott, White Leghorn, 1,493 eggs, £1 ; (4) Hillcrest Poultry Farm, White Leghorn, 1,482 eggs, 10s.

Quarterly prizes :—

1st April to 30th June, 1916.—(1) W. F. Elliott, 351 eggs, £1 10s. ; (2) H. C. Bailey, 346 eggs, £1.

1st July to 30th September, 1916.—(1) A. E. Brown, 451 eggs, £1 ; (2) Hillcrest Poultry Farm, 429 eggs, 10s.

1st October to 31st December, 1916.—(1) S. H. K. Champion, 461 eggs, £1 ; (2) Mrs. H. Snowden, 453 eggs, 10s.

1st January to 31st March, 1917.—(1) T. Partridge, 358 eggs, £1 10s. ; (2) J. R. Stewart, 336 eggs, £1.

Quality Prizes :—Ten groups of six pens, conforming most closely to standard type, were selected and allowed to compete for these prizes, which were finally allotted on the number of eggs laid. No prize to be allotted to any group laying less than 1,080 eggs in twelve months.

(1) J. M. Weaver, White Leghorn (birds Nos. 229-234), 1,526 eggs, £1 10s. ; (2) W. F. Elliott, White Leghorn (birds Nos. 349-354), 1,493 eggs, £1.

SECTION B.—HEAVY BREEDS.

Greatest number of eggs laid during twelve months (individual hens).—(1) P. C. McDonnell, Black Orpington (bird No. 292), 312 eggs, £2 10s. ; (2) T. J. Earl, Black Orpington (bird No. 394), 297 eggs, £2 ; (3) P. C. McDonnell, Black Orpington (bird No. 290), 279 eggs, £1 10s. ; (4) P. C. McDonnell, Black Orpington (bird No. 289), 274 eggs, £1 ; (5) P. C. McDonnell (bird No. 291), 273 eggs, 10s.

Greatest number of eggs laid during twelve months (groups of six birds).—(1) P. C. McDonnell, Black Orpington, 1,479 eggs, £2 ; (2) R. G. Christie and Son, Black Orpington, 1,356 eggs, £1 10s. ; (3) T. J. Earl, Black Orpington, 1,342 eggs, £1 ; (4) W. H. Forsyth, Silver Wyandotte, 1,326 eggs, 10s.

Mr. T. J. Earl's Black Orpington

Laid 297 eggs in twelve months.
Second Prize in Section B.

Mr. A. E. Brown's Chinese Langshan.

The highest for the breed with 272 eggs for twelve months.

Quarterly Prizes :—

1st April to 30th June, 1916.—(1) P. C. McDonnell, 388 eggs, £1 10s. ; (2) R. G. Christie and Son, 387 eggs, £1.

1st July to 30th September, 1916.—(1) R. G. Christie and Son, 426 eggs, £1 ; (2) P. C. McDonnell, 411 eggs, 10s.

1st October to 31st December, 1916.—(1) F. S. Horner, 433 eggs, £1 ; (2) D. Little, 407 eggs, 10s.

1st January to 31st March, 1917.—(1) W. H. Forsyth, 325 eggs, £1 10s. ; (2) P. C. McDonnell, 285 eggs, £1.

Quality Prizes :—Ten groups of six pens, conforming most closely to standard type, were selected and allowed to compete for these prizes, which were finally allotted on the number of eggs laid. No prize to be allotted to any group laying less than 1,080 eggs in twelve months.

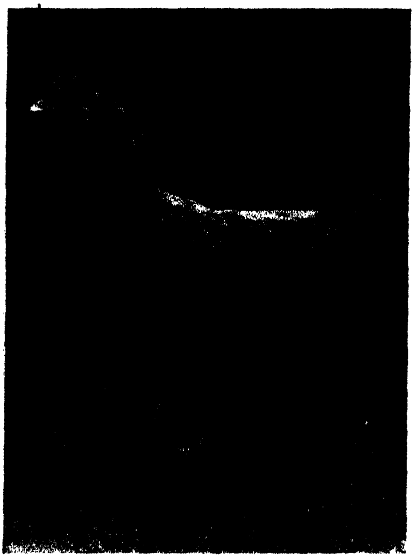
(1) Mrs. Hardcastle, Black Orpington (birds Nos. 313-318), 1,278 eggs, £1 10s. ; (2) C. Bloomfield, Black Orpington (birds Nos. 271-276), 1,193 eggs, £1.

THE FINANCIAL ASPECT.

The value of the total feed consumed by the 540 birds in the first and second year sections was £177 8s. 6d., averaging 6s. 7d. per head. The total net value of the eggs, after deducting freight and selling charges, was £580 19s. 2d., leaving a surplus of £403 10s. 8d., equal to a profit over cost of feed of 14s. 11d. per head.

For the purpose of comparison the cost of feeding in the various sections has been estimated to be as follows :—

Second Year Hens	5s. 8d. per head.
Section A	6s. 10d. ,,
Section B	6s. 10d. ,,



Mr. F. Clayton's Rhode Island Red.
The highest for the breed with 264 eggs.

Mr. W. H. Forsyth's Silver Wyandotte.
The highest for the breed with 259 eggs.

SECOND YEAR HENS.

Market value of eggs laid, £101 9s. 2d., less cost of feeding, £34, leaving a balance of £67 9s. 2d., or 11s. 3d. per head.

FIRST YEAR HENS.

Section A.

Market value of eggs laid, £284 17s. 0½d., less cost of feeding, £82, leaving a balance of £202 17s. 0½d., or 16s. 10d. per head.

Section B.

Market value of eggs laid, £194 12s. 11¾d., less cost of feeding, £61 10s., leaving a balance of £133 2s. 11¾d., or 14s. 9½d. per head.

THE MONTHLY LAYING.

Month.	Second-year Test.	First-year Test.	
		Section A.	Section B.
	120 hens.	240 hens.	180 hens.
April, 1916 ...	895	2,540	1,914
May, ,, ...	654	3,745	2,780
June, ,, ...	843	4,017	3,129
July, ,, ...	1,578	4,441	3,492
August, ,, ...	2,275	5,080	3,760
September, ,, ...	2,469	5,593	3,850
October, ,, ...	2,522	5,687	3,757
November, ,, ...	2,047	4,897	2,886
December, ,, ...	2,196	5,335	2,903
January, 1917 ...	1,901	4,340	2,338
February, ,, ...	1,410	3,340	2,028
March, ,, ...	1,047	2,826	1,791
Totals ...	19,837	51,841	34,628

POULTRY EXPERT'S COMMENTS.

During the last two months of the competition special interest has been excited from the circumstance of a few hens which promised well to put up world's records, and during the later weeks this interest became intensified when one hen had passed the world's authentic headed record of 303 eggs, while another followed close upon her heels. Additional interest arose from the fact of these being pure-bred hens, while the previous world's record holder was not quite in that category. As a matter of fact, 289 eggs was the previous highest authentic record for a pure-bred hen. Speculation was then rife as to how far these world-breaking records would be exceeded. Reduced to outstanding features the complete figures are, that Mr. McDonnell's Black Orpington hen finished by breaking all these records, having laid 312 eggs, followed closely by another, Mr. Appleyard's hen, with 308 eggs, and others on and about the 300 mark, while the general average over the whole of the first-year hens is 205·8, and that of the two-year hens is 165.

If the single hen tallies stood alone there would be much cause for gratification, but when they are backed up by the highest average yet attained in these competitions, followed by the lowest mortality among the hens, it is doubly gratifying, because it is in this that the commercial factors are so strongly emphasised. The previous high average for the first-year hens was in the last competition, namely, 192 eggs per hen. Taking Sections A and B this year for the purpose of comparison on the same basis as in previous years, the highest average previous to that was made in 1910, namely, 184 eggs per hen, but this year there is a splendid average of 205·8. It will thus be seen that substantial progress has been made in this important respect. Nor do first-year hens stand alone, as the second-year hens put up a most creditable performance.

Many theories will be advanced to account for such splendid results. Some will express the opinion that it is the single penning that increased the average, but it has to be remembered that only the first-year hens were in single pens; the second-year hens having been run under the old grouping system of six in a pen, and in the old pens. It is worth while to note in this connection that when the first section of single pens was erected and the results obtained therefrom the system was doubted by many. It was argued that hens being separated would pine for company and, as a consequence, would not put up the best performances; but both Mr. A. A. Dunnicliff, then organising secretary, and myself scouted the idea that such would be the case. We contended that the single pen system only needed a fair trial under improved conditions to prove that the "prophets" were wrong, and that it was only another of those cases in which a limited experience was not to be relied upon. Subsequent competitions have proved the soundness of that view, and the highest records have since been put up on a single-hen basis.

How was it Done?

The question that will doubtless be uppermost in the minds of the poultry-keepers and the public generally is how these splendid results have been obtained, and what are the contributing factors thereto and the lessons to be deduced from them. First of all, we must not overlook the fact that such results could not have been obtained without good work on the part of the College staff. No matter how good the birds on a poultry farm may be, results can only be obtained by efficient management of the birds. The next lesson is to be found in the character of the birds themselves; improvement in this direction is due to an effort on the part of competitors. This feature has been sadly lacking in many previous competitions, and not altogether absent in this one. It is well known among poultry farmers of this State that upon entering the Department of Agriculture and assuming some responsibility in connection with these competitions, the writer was much concerned at the low standard of quality and physique in many of the birds then competing, and set out to draw competitors' attention to this fact. The Committee of Management endorsed this view. This led up to the enforcement of a minimum weight standard for birds entering the competition. Opposition was at first encountered from a small section of competitors, and many were in doubt; but the good sense of competitors generally reposed confidence in their committee. It would be a bold poultryman who, to-day, would advocate returning to old conditions. So much for this aspect of the matter.

Feed upon which these Tallies were made.

A much-needed lesson might be learned by poultry people from the methods of feeding the competition birds. It might be said at once that no special foods, spices, tonics, or sugar enter into the food rations, except in the case of sickness. Healthy hens got nothing beyond an occasional dose of Epsom salts or sulphur, and the results as tabulated have been achieved solely on the ordinary class of food available to every poultry-keeper. Yet, while this is the case, poultry-keepers are continually speculating on food and food values, often carrying out experiments which experience would have shown them to be of no value. The splendid performances in this competition have been put up on a simple balanced ration which has been placed consistently before poultry-keepers during the last three years, the formula for which is given below:—

For the morning mash.	
Pollard	60 lb.
Bran	20 ,,
Lucerne dust	12 ,,
Meat or blood meal ...	8 ,,
	100 lb.

Evening ration of grain.
Two-thirds wheat.
One-third crushed maize.

With the morning mash 22 oz. of common salt is used, and to ensure its even distribution through the mash, the salt is dissolved in the water with which the mash is mixed.

It should be understood that the above are the proportions of the mash, and not the quantity given to any number of fowls; but the birds are given as much at each meal as they will eat up readily.

COMPARISON OF RESULTS.

The following tables analyse and compare the results of the whole series:—

Second-year Hens.

	No. of Pens.	Highest total, two years.	Highest total, second year.	Average per hen, first year.	Average per hen, second year.	Profit over feed per hen, first year.	Profit over feed per hen, second year.	Greatest value of eggs per pen, two years.
						s. d.	s. d.	£ s. d.
1st ..	40	2,487	1,054	180	124	11 2	6 0½	12 1 6
2nd ...	50	2,634	1,150	179	127	10 11	5 4¾	12 16 9
3rd ...	40	2,319	1,013	190	140	11 4	9 8	13 2 5
4th ...	40	2,369	1,045	194	134	16 9	5 8	12 14 2
5th ...	30	2,372	1,110	184	140	10 2	8 3	12 2 2
6th ...	30	2,373	1,028	201	135	14 4	6 11	12 11 7
7th ...	30	2,552	1,091	194	145	14 0	7 6	13 12 3
8th ...	28	2,421	1,156	190	158	13 7	9 2	12 1 8
9th ...	29	2,572	1,213	201	161	13 1½	11 6	14 5 2
10th ...	20	2,647	1,231	213	165	17 1	11 3	15 0 11¾

	Eggs per Hen.		Value per Hen.	
	First Year.	Second Year.	First Year.	Second Year.
			£ s. d.	£ s. d.
84 White Leghorns	213·9	168·4	1 4 9	0 16 9½
6 Silver Wyandottes	232·8	133·5	1 8 7	0 15 5¼
30 Black Orpingtons	207·2	162·8	1 3 9	0 17 6½

ANNUAL COMPETITION.

	No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Greatest Value.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Profit over Feed.
1st ...	38	1,113	459	137	130	140/-	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	150/-	1/3¾	17/9	5/9¾	12/-
3rd ..	100	1,224	532	154	152	114/-	1/-	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	125/-	-/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	137/-	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	149/-	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	146/-	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	173/-	1/5¼	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	134/5	1/2	16/3½	6/5½	10/2
10th ...	50	1,389	687	146	184	141/9	1/2½	18/5½	6/1½	12/4
11th ...	50	1,461	603	156	178	164/7	1/3½	19/4¼	7/3½	12/0¾
12th ...	50	1,360	724	152	177	145/3	1/2½	17/7	5/9	11/10
13th ...	63	1,541	705	162	181	152/9	1/2	17/8½	6/9½	10/11
14th ..	70	1,449	506	165	192	172/7	1/4½	22/2	7/7	14/7
15th A	40	1,526	924	162	216	171/11	1/3¾	23/8¾	6/10	16/10¾
15th B	30	1,479	749	165	192	171/3	1/3¾	21/7½	6/10	14/9½

	Eggs per Hen.	Value per Hen. £ s. d.
Section A.		
210 White Leghorns	219	1 4 1
18 Chinese Langshans	219	1 4 10
6 Sicilian Buttercups... ...	154	0 16 0
6 Black Leghorns	159	0 15 7
Section B.		
108 Black Orpingtons	194	1 2 5
12 Plymouth Rocks	209	1 3 9
36 Rhode Island Reds... ...	179	0 19 8
18 Silver Wyandottes... ...	203	1 3 0
6 Red Sussex	164	0 17 0

Monthly Scores of Leading Birds.

The following individual monthly scores of the leading ten birds in Sections A and B will prove of interest:—

Owner and Breed.	Hen No.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	February.	March.	Total.
			Section A.											
W. H. Appleyard, White Leghorn ...	339	13	25	25	25	27	29	30	20	20	28	23	25	308
Mrs. F. Skinner, White Leghorn ...	150	9	22	24	24	25	29	27	30	30	28	25	27	300
J. M. Weaver, White Leghorn ...	233	23	25	24	25	25	27	27	24	28	25	21	23	297
E. Kennedy, White Leghorn	242	21	25	24	25	25	27	27	24	25	25	21	20	289
Mrs. H. Snowden, White Leghorn ...	381	21	23	22	24	24	26	28	25	27	23	23	22	288
Mrs. H. Snowden, White Leghorn ...	380	22	24	24	24	24	26	27	24	27	25	18	21	286
S. H. K. Champion, White Leghorn ...	250	22	25	23	21	19	28	30	27	28	26	21	16	286
S. McIllwraith, White Leghorn ...	141	17	27	24	27	26	24	28	24	27	22	21	19	286
Mrs. Bradburne, White Leghorn ...	1	22	23	24	23	25	26	26	26	27	21	14	21	278
Hillcrest Poultry Farm, White Leghorn	136	5	20	23	23	27	25	27	25	28	26	19	30	278
			Section B.											
P. C. McDonnell, Black Orpington ...	292	25	28	25	30	31	27	23	25	30	24	19	25	312
T. J. Earl, Black Orpington	394	25	28	25	17	25	28	28	26	30	26	20	19	297
P. C. McDonnell, Black Orpington ...	290	23	27	21	8	25	26	27	24	29	27	19	23	279
P. C. McDonnell, Black Orpington ..	289	15	22	24	13	25	26	28	24	28	22	25	22	274
P. C. McDonnell, Black Orpington ..	291	20	23	20	23	23	30	36	23	27	25	14	19	273
R. G. Christie & Son, Black Orpington	407	25	29	25	27	27	28	28	21	11	18	20	13	272
P. Kinney, Black Orpington	410	7	19	25	27	26	29	27	25	27	24	18	17	271
Mrs. Hardcastle, Black Orpington ...	316	12	26	23	21	22	26	27	25	25	22	17	23	269
F. Clayton, Rhode Island Red ...	175	24	24	22	23	23	28	23	23	19	21	11	28	264
King and Watson, Black Orpington ...	278	18	24	23	24	23	25	24	23	23	14	24	19	264

The Detailed Returns.

The following tables give full details of the number of eggs laid by each group of six birds, together with the market value and weight of the eggs. The figures in parentheses after each competitor's name in the two-years' test indicate the deaths and replacements during the whole period of the competition, and in Sections A and B the deaths or replacements during the year.

SECOND-YEAR HENS.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second Year.	Total, 2 years.	Weight per doz.	Value Second Year.			Total Value.		
																oz.	£	s.	d.	£	s.	d.
1. T. E. Jarman (2), Eastwood : White Leghorns	1416	104	65	72	106	117	126	139	123	115	110	86	68	1231	2647	27	6	14	11¼	15	0	11¾
2. L. Graham (0), Moruya : White Leghorns	1449	77	35	12	63	117	133	139	122	139	125	94	53	1109	2558	31	5	12	4¼	14	4	11¾
3. J. King (0), Wallsend : Black Orpingtons	1402	78	80	76	98	113	118	119	88	100	97	85	78	1130	2532	30	6	6	5	14	4	11¾
4. M. A. White (1), Wilberforce : White Leghorns ..	1322	21	6	34	114	134	138	153	117	141	123	104	95	1180	2502	30	5	16	6¼	13	9	8
5. Mrs. W. V. Hopkins (1), Westmead : Black Orpingtons.	1262	38	67	84	118	123	131	134	90	120	104	81	96	1186	2448	30	6	8	4¾	13	8	6½
6. W. Maskell (0), Ravensfield P. F., Farley : White Leghorns.	1358	31	48	68	99	110	112	95	90	103	113	80	67	1016	2374	32	5	8	2	13	7	4¼
7. T. G. Wilson, (0), Walli : White Leghorns	1240	10	37	64	89	128	140	132	123	114	94	101	68	1100	2340	30	5	11	10	12	13	4¼
8. E. S. Taylour (0), Wentworthville : White Leghorns.	1311	26	11	35	55	110	128	140	122	135	115	85	42	1004	2315	32	4	17	1¼	12	8	3¼
9. G. White (0), Willoughby : White Leghorns	1272	49	38	56	67	106	127	120	103	109	100	75	71	1021	2293	30	5	6	7	12	14	2¾
10. S. Bertles, jnr. (0), Bolwarra : White Leghorns ..	1202	53	17	17	79	137	134	136	114	114	116	89	69	1075	2277	32	5	6	10	12	4	1¼
11. A. Greentree (1), Wilberforce : White Leghorns ..	1292	7	2	26	85	126	132	144	114	110	104	53	49	952	2244	30	4	9	3¼	11	14	5¼
12. P. Lawless (0), Berowra : White Leghorns	1247	27	12	30	81	114	127	134	117	113	90	69	39	953	2200	32	4	12	8¼	11	16	10¾
13. R. Jobling (2), Wallsend : Silver Wyandottes ..	1397	103	79	54	38	82	107	92	68	57	45	48	28	801	2198	30	4	12	8¼	13	4	8¼
14. T. Pritchard (0), Lawson : Black Orpingtons.. ..	1243	66	42	31	87	101	121	149	50	104	70	82	64	937	2180	30	5	0	6¾	11	12	11¼
15. Wharepaka P. Yds. (0), Berowra : White Leghorns	1238	6	0	8	65	124	140	140	135	135	105	49	26	933	2171	30	4	3	11¼	11	4	9¼
16. E. Buckland (0), St. John's Park : White Leghorns .	1172	46	2	5	57	120	115	134	119	133	96	76	58	961	2133	27	4	12	6¼	11	7	11
17. Glenview P. Farm (0), Berowra : White Leghorns ..	1264	40	40	57	107	108	83	89	61	75	70	43	18	791	2055	26	4	4	11¼	11	14	11
18. A. Duffield (6), Carlingford : White Leghorns ..	1202	31	0	0	25	109	145	146	131	119	98	19	3	826	2028	30	3	12	4¼	10	9	6¾
19. H. Scott (1), Lakemba : Black Orpingtons	1174	41	15	44	79	117	119	120	88	67	57	46	12	805	1979	25	4	0	5¼	10	18	3
20. A. R. Kennedy (3), Carlingford ; Black Orpingtons..	1136	41	58	70	66	79	93	97	72	93	69	45	43	826	1962	27	4	10	7½	11	5	6¼

FIFTEENTH ANNUAL COMPETITION.

Section A (Light Breeds).

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
1. J. M. Weaver (0), Pine Ridge, Castle Hill : White Leghorn. Market Value, £8 11s. 11¾d.	19	15	19	21	24	25	25	20	26	20	19	19	252		28½
	8	25	15	26	23	25	26	21	26	22	7	11	235		25½
	22	23	24	20	22	23	26	23	28	23	19	13	266		28½
	14	16	19	18	22	24	23	22	24	21	10	16	229		25½
	23	25	24	25	25	27	27	24	28	25	21	23	297		24
	18	10	16	22	22	25	24	22	24	20	20	24	247	1526	25½
2. S. H. K. Champion (1), Woonona : White Leghorn. Market Value, £8 5s. 0½d.	0	3	14	24	25	27	28	25	28	15	23	19	*231		27
	9	6	22	10	24	27	26	25	26	6	13	17	211		24
	22	23	23	22	26	28	28	24	24	20	18	18	276		26
	22	25	23	21	19	28	30	27	28	26	21	16	286		24
	13	23	20	20	24	22	23	21	23	22	17	6	234		24
	6	21	23	22	25	26	27	23	25	20	19	19	256	1494	24
3. W. F. Elliott (0), Studley Park, Werrington : White Leghorn. Market Value, £8 9s. 2¾d.	18	13	23	24	24	26	29	26	16	9	0	0	208		26
	13	15	22	24	26	28	31	26	21	16	22	11	255		28
	15	22	12	23	23	25	27	26	26	20	15	14	248†		31½
	15	21	22	21	21	24	23	26	28	18	16	19	254		28
	23	25	23	25	23	23	22	21	24	20	18	20	267		31½
	21	24	24	25	22	20	23	22	25	21	17	17	261	1493	28
4. Hillcrest Poultry Farm (1), Berowra : White Leghorn. Market Value, £8 6s. 10d.	7	24	23	25	25	29	27	22	23	21	17	21	264		27
	21	21	25	23	23	23	25	21	25	21	17	17	262		26
	3	18	19	22	22	21	23	18	19	19	14	15	213		31½
	5	20	23	23	27	25	27	25	28	26	19	30	*278		25½
	17	23	21	24	24	23	25	19	18	11	2	1	208		28
	11	21	19	22	23	25	25	24	24	23	21	19	257	1482	27
5. B. Clarke (0), Barber's Creek, Old Guildford : White Leghorn. Market Value, £8 4s. 10½d.	6	23	21	22	21	24	25	24	26	22	18	13	245		28½
	15	22	22	20	21	23	25	22	21	19	18	21	252		27
	11	22	22	25	25	25	25	22	26	23	20	21	267		26
	12	17	18	23	24	27	28	27	27	24	19	14	260		28½
	10	23	23	21	24	23	22	16	21	17	14	19	233		29
	15	20	21	21	23	22	21	20	23	16	5	0	207	1464	27
6. Mrs. H. Snowden (0), Tumut : White Leghorn. Market Value, £8 1s. 4d.	7	16	17	16	24	24	26	23	23	20	9	0	205		24
	22	24	24	24	24	26	27	24	27	25	18	21	286		24
	21	23	22	24	24	26	28	25	27	23	23	22	288		24
	5	8	15	2	16	23	24	24	27	18	11	9	182		27
	9	24	22	23	24	25	26	24	25	22	17	19	260		24
	20	24	20	21	22	23	25	23	25	21	5	0	229	1450	24
7. E. Kennedy (0), Comerong, Nowra : White Leghorn. Market Value. £8 1s. 8¾d.	11	3	19	19	22	23	23	21	22	21	16	7	207		30
	21	25	24	25	25	27	27	24	25	25	21	20	289		30
	14	12	5	5	18	23	24	20	19	11	8	1	160		30
	19	22	22	26	23	24	14	20	24	23	20	17	254		28
	19	22	20	23	23	25	23	20	21	20	18	19	253		28½
	21	21	18	23	26	26	29	22	26	25	19	20	276	1439	30
8. J. R. Stewart (0), Denfield Poultry Farm, Thirlmere : White Leghorn. Market Value, £7 16s. 7¾d.	2	18	22	23	23	25	28	24	26	24	20	19	254		28½
	2	12	15	13	22	27	28	25	25	23	19	21	232		27
	8	17	20	19	22	23	25	21	25	21	14	17	232		27
	7	22	24	22	24	24	17	24	26	24	16	18	248		25½
	3	12	19	21	21	24	26	23	24	23	14	4	214		27
	12	21	20	23	23	26	27	22	26	22	23	14	259	1430	25½
9. T. Partridge (0), Bridge-road, Westmead : White Leghorn. Market Value, £7 15s. 1d.	19	22	22	22	24	25	27	20	26	21	20	21	269		27
	4	11	21	12	21	26	28	25	27	23	22	22	242		28½
	1	18	23	24	20	24	30	27	25	25	23	22	263		27
	8	7	14	12	22	25	23	22	24	20	19	17	213		27
	17	13	11	13	11	23	22	22	26	15	17	10	200		28½
	6	12	18	20	22	23	26	24	26	14	21	26	238	1425	28½
10. Hillsmith Bros. (2), Houison-street, Westmead : White Leghorn. Market Value, £7 14s. 3½d.	2	8	2	15	24	26	25	23	25	13	8	15	186		27
	19	22	21	17	19	27	26	19	27	21	19	19	256		30
	6	24	20	18	21	25	20	21	24	17	17	11	224		24
	23	24	24	26	25	26	29	19	16	8	0	0	†220		31
	23	18	20	21	21	25	27	25	24	18	18	20	260		28
	19	23	22	24	23	25	24	21	25	21	3	0	†230	1376	24
11. W. H. Appleyard (0), Pine Grove, Guildford : White Leghorn. Market Value, £7 13s. 1½d.	12	16	13	18	28	25	27	25	25	21	18	9	232		24
	3	22	21	21	20	26	24	22	27	24	17	0	227		28
	13	25	25	25	27	29	30	29	29	28	23	25	308		30
	13	22	19	21	20	26	21	22	27	24	18	19	252		24
	19	12	7	3	8	2	13	11	12	6	0	0	93		27
	20	20	24	16	22	26	29	28	27	23	20	5	260	1372	27
12. Mrs. Bradburne (0), Paris-street, Kogarah : White Leghorn. Market Value, £7 12s. 2½d.	22	23	24	23	25	26	26	26	27	21	14	21	278		24
	7	14	19	14	20	23	22	22	21	18	13	16	209		24
	7	0	13	17	21	24	21	24	18	22	1	0	168		27
	18	20	21	21	24	23	14	19	7	13	8	4	192		27
	10	22	24	18	24	29	29	23	25	25	17	21	267		30
	14	22	23	20	23	22	26	21	24	21	20	18	254	1368	28½

* Bird replaced ; score struck out.   † Bird died ; not replaced.

FIFTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
13. **W. D. Stokes** (0), Orchard Town, New Lambton: Chinese Langshan. Market Value, £7 18s. 1¼d.	15	14	11	24	26	26	13	2	14	9	4	11	169		25½
	21	25	13	27	28	19	30	17	18	20	26	19	263		28½
	25	15	20	19	27	23	17	6	16	22	11	23	224		25
	22	30	24	24	27	22	25	14	22	15	27	18	270		24
	6	15	23	15	21	22	18	12	13	16	11	9	181		30
	21	23	20	22	21	23	23	22	11	21	18	22	247	1351	25½
14. **A. Windeyer** (0), Murray-road, Beecroft: White Leghorn. Market Value, £7 11s. 5d.	19	22	22	21	20	19	21	18	20	15	10	13	220		30
	11	14	12	4	17	24	22	22	27	15	0	0	168		30
	5	19	18	21	23	21	16	26	25	22	17	5	212		24
	3	14	19	16	16	19	23	22	27	23	19	12	213		24
	17	23	21	23	24	25	25	23	24	24	23	22	274		27
	23	21	20	22	25	25	25	25	27	25	23	6	267	1354	30
15. **L. K. Pettitt** (0), Balaclava-road, Eastwood: White Leghorn. Market Value, £7 8s. 11¾d.	12	12	14	19	20	20	20	19	21	18	19	21	215		32
	9	15	14	13	23	24	27	23	25	24	19	20	236		28
	13	19	19	23	22	24	25	23	22	25	20	23	258		30
	3	24	11	11	23	24	24	23	24	21	6	0	194		27
	11	25	18	20	20	20	22	21	21	22	7	0	207		30
	11	22	22	19	23	24	22	18	22	20	16	18	237	1347	30
16. **A. E. Brown** (0), Murray-road, Beecroft: Chinese Langshan. Market Value, £7 6s. 6¾d.	9	23	20	26	24	31	29	12	23	12	22	25	256		27
	0	0	6	26	22	14	19	3	14	15	17	10	146		28½
	12	22	20	25	26	28	27	26	27	20	19	20	272		30
	1	7	21	27	27	16	28	11	28	13	22	9	210		25
	2	0	21	30	27	27	30	19	22	17	17	14	226		24¾
	14	25	24	24	25	26	19	9	16	19	10	13	224	1334	25½
17. **H. Hammill** (0), Kogarah: White Leghorn. Market Value, £7 0s. 2¼d.	8	0	0	8	21	26	25	26	26	12	21	22	195		30
	13	22	15	19	22	25	23	19	22	12	10	8	210		24
	5	3	20	21	22	25	26	22	28	25	21	24	242		27
	19	20	20	23	23	24	23	21	25	21	14	19	252		27
	10	0	8	23	24	26	28	25	28	25	21	22	240		27
	0	0	10	21	22	21	26	20	22	21	19	11	193	1332	27
18. **H. C. Bailey** (0), Elgin Stud Poultry Farm, Thirlmere: White Leghorn. Market Value, £7 12s. 7¼d.	18	24	20	22	22	23	25	23	23	17	19	19	255		27
	21	23	22	20	21	24	24	22	19	19	16	12	243		28½
	16	19	18	21	19	21	18	14	17	12	2	6	183		28½
	21	18	14	8	23	25	29	25	23	11	1	5	203		24
	23	23	22	22	23	26	18	21	24	21	22	17	262		27
	8	14	22	23	23	10	20	9	20	11	11	2	182	1328	28½
19. **G. A. Steele** (0), Planthurst-road, Kogarah: White Leghorn. Market Value, £7 3s.	7	0	6	24	26	28	27	27	28	20	19	22	234		30
	17	20	19	23	24	22	25	22	23	17	9	9	230		30
	11	22	18	23	25	25	25	22	21	19	19	6	236		29¼
	0	20	10	10	23	25	25	15	26	19	20	13	206		29½
	22	0	15	25	24	27	25	14	13	8	21	4	198		29¼
	16	20	17	23	21	26	25	21	23	18	7	7	224	1328	30
20. **W. Hirst** (0), Walters-road, Blacktown: White Leghorn. Market Value, £7 8s. 9½d.	15	12	19	17	21	24	24	20	27	22	14	12	227		27
	13	20	21	21	21	21	25	21	24	22	17	17	243		27
	7	17	20	20	23	26	11	7	28	23	19	10	211		27
	6	13	21	20	23	23	21	19	21	18	13	0	198		28½
	8	18	21	22	23	23	24	2	0	18	10	15	184		28½
	16	23	19	22	22	24	25	20	24	23	18	24	260	1323	25½
21. **S. McIlwraith** (1), Hoxton Park: White Leghorn. Market Value, £7 4s. 7½d.	9	22	21	23	25	26	23	23	21	21	18	19	251		28½
	5	17	22	24	23	28	27	24	25	23	21	20	259		25
	17	27	24	27	26	24	28	24	27	22	21	10	286		24
	12	10	3	1	3	2	3	0	0	2	0	0	†36		27
	6	3	23	24	25	24	27	22	24	24	18	4	224		24
	7	5	22	26	27	21	23	23	26	24	22	22	248	1304	27
22. **Johns Bros.** (0), Box 10, Wyong: White Leghorn. Market Value, £6 16s. 10½d.	1	0	1	11	20	21	24	22	21	18	3	0	142		24
	15	20	20	20	23	24	24	21	26	22	16	9	240		24
	0	0	22	22	24	26	28	27	29	26	23	22	249		24
	0	22	21	22	23	26	23	23	23	26	20	19	248		24
	0	11	16	13	25	24	23	23	25	13	13	23	209		24
	8	12	17	16	19	22	24	21	25	20	11	18	213	1301	24
23. **G. Hopping** (2), Wattle Dell, Ingleburn: White Leghorn. Market Value, £7 4s. 0½d.	10	20	19	21	16	24	26	23	27	19	20	19	244		25½
	14	19	19	16	21	21	23	19	24	18	12	7	213		30
	10	24	24	26	17	22	28	25	27	23	21	22	269		28
	0	15	10	14	25	27	22	22	22	19	17	20	*213		30
	11	13	10	20	22	15	0	0	0	0	0	0	†91		30
	9	24	24	25	26	26	30	9	20	10	17	23	243	1273	30
24. **A. J. Heaver** (0), May's Hill, Western-road, Parramatta: White Leghorn. Market Value, £6 18s. 1d.	15	17	18	14	20	22	25	24	23	23	6	8	210		28½
	10	20	13	16	20	22	24	24	25	20	19	11	224		27
	1	15	14	13	23	26	25	23	24	25	21	20	230		27
	9	23	20	13	16	23	21	16	21	18	12	14	206		24
	16	14	10	10	19	24	22	19	21	22	11	4	192		30
	3	14	20	16	14	24	26	23	27	11	10	17	205	1267	29

* Bird replaced; score struck out. † Bird died; not replaced.

FIFTEENTH ANNUAL COMPETITION—*continued.*
Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
25. **S. W. Rutherford** (1), The	8	2	15	20	19	14	0	0	1	0	0	0	†79		26
Esplanade, Guildford:	16	17	15	21	20	24	22	20	24	19	12	9	219		27
Chinese Langshan.	20	24	23	19	15	21	21	16	20	21	18	16	234		27
Market Value, £7 2s. 5¾d.	8	28	22	22	21	25	27	22	29	22	21	20	267		27
	20	20	26	21	22	24	24	19	24	19	18	11	243		25½
	0	2	15	17	17	25	26	26	26	23	20	22	219	1261	25½
26. **J. J. McKenna, Junior** (1)	5	17	19	22	24	24	24	20	25	22	21	19	242		27
Rouse Hill: White Leghorn.	3	18	6	20	23	22	29	22	28	25	1	0	197		24
	3	12	6	10	22	22	22	19	21	20	17	19	193		30
Market Value, £6 10s. 10d.	0	15	23	24	27	27	26	24	26	9	12	24	*237		27
	1	0	1	0	20	27	27	24	22	20	9	3	154		27
	1	16	22	12	24	24	27	22	26	21	21	20	236	1259	27
27. **M. Fagelman** (0), Cheswick-road,	7	22	19	19	22	21	25	25	27	22	17	17	243		29
Bankstown:	13	12	13	11	18	22	23	22	24	19	15	1	193		27
White Leghorn.	2	15	21	22	21	21	24	21	25	23	17	19	231		27
Market Value, £6 15s. 3d.	15	22	19	15	20	23	20	12	15	12	8	0	181		27
	7	10	23	21	22	25	24	19	22	15	15	4	207		27
	7	0	5	19	23	23	23	21	22	21	19	10	193	1248	30
28. **G. Barwick** (0), Wallalong,	9	24	20	23	21	25	24	23	20	18	16	16	239		24
Hinton: White Leghorn.	8	2	19	9	24	25	29	23	25	18	18	1	201		26
Market Value, £6 12s. 10d	7	14	10	6	17	22	22	22	23	20	1	0	164		25
	8	19	18	21	24	25	26	19	25	19	18	9	231		27
	10	17	20	18	19	21	16	17	18	15	11	10	192		26
	5	12	17	22	22	27	27	22	24	23	7	0	208	1235	27
29. **C. C. Kennett** (0), Hazelwood	14	18	8	8	16	21	28	24	27	20	23	20	227		24
Farm, Glenfield:	0	17	11	13	22	25	26	25	28	13	18	9	217		28½
White Leghorn.	2	18	7	22	23	25	27	24	24	18	5	3	198		31½
Market Value, £6 9s. 2½d.	8	21	19	21	23	25	26	22	26	20	8	6	225		29
	16	21	21	24	22	28	24	22	24	22	8	1	233		30½
	2	0	1	1	22	25	23	15	24	19	0	0	132	1232	25
30. **John McGregor** (0), Oxford	18	14	19	22	21	21	24	24	21	18	20	19	241		24
Falls, P.O., Brookvale:	8	0	8	8	13	21	23	20	7	0	0	0	108		25½
White Leghorn.	10	6	13	10	18	24	27	25	26	21	20	12	212		24
Market Value, £6 15s. 2¾d.	25	24	25	23	26	26	31	25	25	19	3	0	252		24
	12	18	8	21	17	21	22	22	22	17	16	4	200		24
	22	21	20	20	20	23	25	21	18	14	8	5	217	1230	24
31. **Mrs. E. Hunt** (0), Careenya,	10	17	17	18	19	21	24	16	23	22	19	6	212		24
Berowra: White Leghorn.	14	15	11	13	15	15	14	5	7	1	7	0	117		24
Market Value, £6 13s. 11¾d.	18	19	21	22	24	25	25	22	26	23	16	11	252		24
	19	3	0	15	22	23	27	24	26	21	19	20	219		25½
	8	14	19	22	23	25	25	22	24	20	7	0	209		24
	15	15	16	13	14	17	18	18	24	18	17	18	203	1212	24
32. **G. Speed** (0), Mt. Druitt:	4	21	11	15	20	25	27	26	27	17	20	20	233		24
White Leghorn.	5	0	0	2	1	0	0	0	0	0	0	0	8		24
Market Value, £6 16s. 8d.	10	23	22	22	21	25	26	24	24	10	14	13	234		16
	19	23	21	23	25	24	24	17	21	14	12	6	229		27
	20	22	20	20	26	26	27	21	25	18	14	5	244		21
	18	21	19	23	21	24	26	25	25	23	19	18	262	1210	30
33. **A. H. Collings** (1), Sunshine	12	17	19	19	22	24	25	14	25	21	13	9	220		24
Poultry Ranch, McCauley-avenue,	1	20	13	15	21	27	25	20	0	0	0	0	†142		24
Bankstown:	17	20	17	14	25	24	21	19	17	19	13	11	217		24
White Leghorn.	3	23	9	13	24	24	28	25	26	18	15	21	229		24
Market Value, £6 11s. 7d.	23	21	17	7	19	20	20	14	15	5	3	1	165		24
	0	12	23	23	21	29	29	24	27	23	7	6	224	1197	26
34. **W. L. Forrest** (1), Harrington-street,	0	1	25	27	26	24	27	24	26	10	6	25	221		26
Marrickville:	0	0	26	27	25	30	27	22	26	16	8	25	232		26
White Leghorn.	0	4	26	24	26	30	27	27	29	26	22	14	255		25½
Market Value, £6 3s. 7d	8	19	21	19	26	28	28	26	29	23	16	5	248		24
	0	4	0	21	16	6	9	8	13	13	10	0	100		24
	0	11	24	18	25	24	5	3	8	0	0	0	†118	1174	27
35. **Mrs. F. Skinner** (1), Oxford-avenue,	9	8	7	1	20	21	23	22	23	14	0	0	148		24
Central Bankstown:	11	11	5	17	18	23	26	21	27	20	18	6	208		24
White Leghorn.	8	0	0	22	20	24	27	25	25	22	2	0	175		25½
Market Value, £5 17s. 3d.	2	0	0	13	10	22	23	20	24	17	2	0	133		30
	3	12	7	15	18	23	26	23	26	24	18	7	202		27
	9	22	24	24	25	29	27	30	30	28	25	27	*300	1161	24
36. **F. J. Brierley** (1), Beecroft-road,	18	20	20	19	23	24	22	21	12	0	0	0	179		27
Cheltenham: White	11	14	18	22	24	23	25	22	24	11	0	0	194		29½
Leghorn.	10	0	8	17	24	27	25	25	28	21	21	21	227		27
Market Value, £6 3s. 5½d.	16	20	18	21	21	21	23	19	20	20	14	6	219		27
	10	14	15	24	23	23	22	21	24	14	0	0	190		29½
	0	0	4	16	19	21	26	21	21	17	6	0	*151	1160	28½

* Bird replaced; score struck out. † Bird died; not replaced.

FIFTEENTH ANNUAL COMPETITION—*continued.*

Section A (Light Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen.
															oz.
37. **D. Chrystal (0), Old Kent road, Punchbowl: White Leghorn.**	9	17	8	14	12	22	20	22	23	20	14	13	194		27
	6	18	18	20	19	2	0	0	0	0	3	0	86		27
	17	22	12	27	24	22	24	21	22	14	14	11	230		28½
Market Value, £6 6s. 6½d.	4	4	13	16	22	24	26	22	25	25	21	19	221		30
	19	22	22	23	22	21	24	18	22	17	18	11	239		27
	8	6	14	22	21	25	23	19	1	5	9	6	159	1129	27
38. **Miss N. Cupitt (2), Camira, Fitzgerald-street, Windsor: White Leghorn.**	7	21	20	19	21	22	25	21	25	12	8	10	211		28½
	18	23	21	19	24	26	25	18	16	0	0	1	191		28½
	18	22	23	24	21	24	24	22	25	22	8	0	†233		27
Market Value, £6 1s. 6d.	2	3	0	0	0	0	0	0	0	0	0	0	†5		—
	17	20	21	23	23	26	26	22	11	25	19	19	252		28½
	7	7	13	13	22	23	24	23	24	14	17	4	191	1088	24
39. **W. Warren (0), Weka Poultry Farm, Lane Cove road, North Ryde: Black Leghorn.**	0	0	1	0	5	18	23	14	21	13	0	0	95		27
	4	9	7	9	11	24	23	22	21	20	16	0	166		30
	11	16	9	9	13	24	22	23	22	20	15	7	191		24
	1	5	4	5	11	23	26	25	25	23	12	0	160		24
Market Value, £4 13s. 8½d.	1	2	2	1	9	21	25	22	23	16	8	0	130		27
	8	17	15	9	22	26	28	20	27	19	15	5	211	953	26
40. **Gillies Bros. (2), Homer-st., Canterbury: Sicilian Buttercup.**	14	21	15	9	13	18	22	23	12	9	20	18	194		27
	0	0	2	19	20	21	24	23	26	24	13	23	195		28½
	0	1	9	11	7	18	22	22	23	18	18	18	167		27
Market Value, £4 16s. 0¾d.	0	4	7	10	10	18	20	15	19	15	10	3	131		24¾
	1	3	0	0	0	19	25	11	0	0	0	0	†59		25
	2	21	19	14	2	24	25	24	13	8	19	7	*178	924	24

* Bird replaced; score struck out. † Bird died; not replaced.

Section B (Heavy Breeds).

															oz.
1. P. C. McDonnell (1), Allerton, Beecroft: Black Orpington.	15	22	24	13	25	26	28	24	28	22	25	22	274		24
	23	27	21	8	25	26	27	24	29	27	19	23	279		24
	20	23	20	23	23	30	26	23	27	25	14	19	273		24
Market Value, £8 11s. 3d.	25	28	25	30	31	27	23	25	30	24	19	25	312		26
	20	16	17	18	20	17	13	7	7	0	0	0	†135		30
	20	21	21	22	23	24	21	14	19	9	3	9	206	1479	30
2. R. G. Christie and Son (0), Sobraon-road, Eastwood: Black Orpington.	18	24	19	25	25	25	24	16	20	22	14	16	248		24
	20	24	23	22	21	23	27	19	15	9	17	14	234		24
	25	25	23	25	23	18	17	20	20	6	19	0	221		24¾
Market Value, £7 19s. 9¾d.	17	12	23	24	23	20	27	12	6	0	0	0	164		26
	25	29	25	27	27	28	28	21	11	18	20	13	272		24
	18	19	18	23	22	25	24	11	18	12	11	16	217	1356	24
3. T. J. Earl (0), Priam-street, Sefton Park: Black Orpington.	3	22	17	30	19	20	16	10	14	16	10	11	188		24
	1	18	25	25	25	19	27	14	16	22	7	1	200		24
	11	24	20	18	19	28	19	16	24	17	20	11	227		24
Market Value, £7 14s. 11½d.	25	28	25	17	25	28	28	26	30	26	20	19	297		24
	24	11	20	27	24	26	19	18	18	15	19	9	230		24
	22	26	16	25	19	15	17	11	18	10	13	8	200	1342	24
4. W. H. Forsyth (0), Forsyth-street, Willoughby: Silver Wyandotte.	6	0	0	0	4	4	10	9	14	20	22	22	111		24
	22	20	23	25	26	24	12	13	15	12	15	4	211		30
	23	21	19	21	23	24	14	18	13	14	18	23	231		28½
Market Value, £7 13s. 4½d	25	26	21	24	24	24	24	23	16	14	16	19	256		25½
	21	21	19	22	22	22	23	23	25	20	20	20	258		27
	2	21	21	23	23	26	28	22	27	21	22	23	259	1326	28½
5. R. Whitelaw (0), Bungarabee-road, Blacktown: Plymouth Rock.	15	13	15	9	22	24	29	23	24	9	21	6	210		24
	2	21	19	7	20	26	20	17	17	10	17	17	193		25½
	13	16	22	24	25	29	23	18	15	14	16	4	219		26
Market Value, £7 5s. 8d.	13	22	20	23	28	14	28	13	14	23	9	23	225		27
	17	23	11	8	28	22	21	12	17	12	3	21	190		27
	22	26	19	25	25	27	31	17	15	15	16	8	246	1283	26
6. Mrs. Hardcastle (0), Rocky Point road, Kogarah; Black Orpington.	2	24	23	21	23	19	24	17	22	11	16	8	210		30
	19	22	19	21	24	26	26	18	21	20	14	8	238		27
	8	28	25	25	25	24	28	8	0	1	0	0	167		31
Market Value, £7 7s. 8d.	12	26	28	21	22	26	27	25	25	22	17	23	269		27
	10	30	24	27	26	24	17	11	16	18	13	5	221		25½
	0	22	14	16	19	19	14	16	16	12	13	12	173	1278	24

* Bird replaced; score struck out. † Bird died; not replaced.

FIFTEENTH ANNUAL COMPETITION—*continued.*

Section B (Heavy Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen. oz.
7. E. J. Kinney (0), Copeland-road, Beecroft: Silver Wyandotte. Market Value, £6 19s. 4½d.	4	1	0	7	24	25	25	23	23	16	0	0	148		25½
	25	23	11	24	23	25	24	15	14	7	21	11	223		27
	17	22	24	25	24	20	24	12	15	15	14	13	225		25½
	4	0	1	9	23	25	22	25	26	3	21	10	169		24½
	22	19	21	25	24	25	27	21	18	11	14	16	243		27
	20	25	21	23	22	25	24	13	18	18	21	17	247	1255	27
8. F. Clayton (3), Blacktown: Rhode Island Red. Market Value, £7 1s. 5d.	24	24	22	23	23	28	23	23	19	21	11	23	264		27
	14	1	0	6	26	5	18	17	0	0	0	0	†87		28½
	0	4	27	28	27	28	23	20	20	9	3	16	*205		26
	24	24	17	22	3	27	26	25	27	25	16	2	*238		28½
	25	23	12	0	15	25	17	16	15	20	19	15	202		25
	11	25	23	23	21	23	23	22	22	22	17	22	*254	1250	28½
9. E. F. Thomson (0), Adderton-road, Dundas: Plymouth Rock. Market Value, £6 19s. 1½d.	12	18	11	23	10	21	18	16	14	10	10	14	177		27
	2	19	20	13	20	21	26	14	16	12	9	12	184		30
	15	23	21	23	23	24	28	22	25	14	17	14	249		30
	8	14	15	22	22	24	14	9	18	21	13	21	201		25½
	16	10	22	25	25	23	21	22	13	13	9	3	202		27
	13	19	22	22	21	27	17	6	21	12	10	20	210	1223	30
10. C. E. Warren (0), Hillcrest-street, Punchbowl: Black Orpington. Market Value, £6 15s. 2d.	2	11	7	15	17	20	23	15	21	16	17	11	175		28
	18	22	19	20	23	24	20	15	20	11	13	12	217		30
	6	22	20	22	22	28	26	9	10	17	21	0	203		24
	19	22	3	28	24	31	32	26	14	16	21	15	251		31
	22	6	9	17	19	18	15	13	11	12	1	0	143		28
	7	17	21	22	23	26	20	19	22	14	12	22	225	1214	30
11. D. Little (0), Delta Farm, Waterloo-rd., North Ryde: Black Orpington. Market Value, £6 10s. 6d.	12	7	23	21	23	28	25	9	23	0	0	0	171		32
	15	16	13	7	18	23	22	23	23	3	0	0	163		27
	8	23	21	18	19	25	26	23	25	22	13	15	238		30
	2	17	20	21	21	23	26	25	27	20	20	2	224		24
	3	14	1	15	22	24	23	21	16	20	13	0	172		25½
	6	20	22	23	23	25	29	25	16	15	13	20	237	1205	32
12. J. Gillies (0), White Hill Poultry Farm, Killara: Rhode Island Red. Market Value, £6 12s. 7d.	9	0	5	26	26	28	25	19	15	13	9	19	194		27
	23	26	23	24	21	20	20	13	11	21	15	8	225		28½
	21	22	20	23	21	25	22	7	2	5	3	10	181		30
	1	2	23	22	26	21	23	24	28	18	19	22	229		30
	2	0	0	12	23	24	25	22	24	14	9	19	174		31½
	22	9	24	12	29	16	20	15	15	10	14	15	201	1204	30
13. C. Bloomfield (0), Alpha-street, Willoughby: Black Orpington. Market Value, £6 18s. 0¾d.	13	21	21	23	22	18	18	17	15	2	11	19	200		30
	22	23	23	23	23	28	22	21	12	7	16	2	222		29½
	5	1	3	0	1	4	20	19	17	11	8	15	104		29½
	22	21	23	26	25	24	21	18	20	14	14	11	239		30
	20	22	20	22	27	26	18	15	23	9	10	12	224		27
	18	21	11	12	21	22	20	19	19	18	6	17	204	1193	30
14. F. S. Horner (0), Prospect-road, Wentworthville: Rhode Island Red. Market Value, £5 18s. 10d.	0	15	14	18	21	26	29	26	28	23	15	13	228		27
	0	3	22	20	20	25	28	24	26	5	0	6	179		28½
	13	0	1	16	24	27	28	26	27	23	18	22	225		28½
	0	0	11	17	18	22	24	22	16	19	10	13	172		30
	0	0	0	18	24	24	29	25	16	21	9	24	190		27
	6	0	21	25	26	24	27	20	12	15	8	13	197	1191	27
15. R. M. Griffiths (0), Forest-road, Bexley: Black Orpington. Market Value, £6 7s. 9d.	0	0	12	22	16	15	15	14	14	11	14	2	135		27
	1	2	27	23	17	15	17	11	17	15	8	16	169		24
	1	0	0	26	26	16	26	13	16	16	7	10	157		27
	12	26	24	24	25	25	24	18	20	13	11	13	235		25½
	23	25	26	27	27	25	21	13	15	12	9	14	237		24
	2	1	18	25	26	27	28	26	29	25	19	18	244	1177	27
16. P. Kinney (1), Carlingford: Black Orpington. Market Value, £6 18s. 5½d.	9	21	21	22	21	26	24	23	22	15	13	18	235		27
	7	19	25	27	26	29	27	25	27	24	18	17	271		24
	28	29	26	27	18	14	15	8	13	6	6	0	190		24
	15	9	9	1	0	0	0	0	0	0	0	0	†34		—
	25	29	25	24	21	22	22	18	17	13	1	0	217		24
	1	18	23	28	28	27	24	21	19	10	20	13	227	1174	24
17. King and Watson (0), Dunheved Poultry Farm, St. Mary's: Black Orpington. Market Value, £6 8s. 1½d.	12	0	15	5	22	25	24	21	25	23	7	0	179		24½
	18	24	23	24	23	25	24	23	23	14	24	19	264		24
	10	0	16	25	25	19	27	9	19	8	3	0	161		30
	8	18	22	22	9	16	19	15	13	15	15	0	172		28½
	20	19	27	11	25	23	20	13	15	13	18	3	207		21
	0	1	21	23	20	24	21	19	12	13	15	9	178	1161	28
18. A. and H. Simpson (1), Church Point, Pittwater: Black Orpington. Market Value, £6 14s. 9½d.	0	15	19	24	24	25	25	20	12	20	8	0	192		30
	10	21	21	24	24	29	24	16	21	9	19	16	234		27
	8	24	22	19	26	29	24	21	13	19	17	1	223		26
	14	25	24	25	25	26	22	17	11	12	22	7	230		28
	22	24	20	23	24	25	22	19	5	0	0	0	184		32
	22	24	21	16	2	0	0	0	0	0	0	0	†85	1148	30

* Bird replaced; score struck out. † Bird died; not replaced.

FIFTEENTH ANNUAL COMPETITION—*continued.*

Section B (Heavy Breeds)—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Individual Totals.	Group Totals.	Weight per dozen. oz.
19. D. Kenway (1), Pennant	1	17	19	20	22	13	17	18	15	9	6	15	172		27
Hills road, West Pennant	22	26	24	25	22	26	22	24	23	12	11	21	258		28
Hills : Black Orpington.	15	8	20	18	16	14	11	11	10	14	5	5	147		28
Market Value, £6 11s. 9d.	0	28	23	25	23	16	9	10	7	2	12	2	157		30
	4	20	24	25	18	25	25	23	20	18	16	10	228		30
	9	28	27	23	26	23	21	0	0	0	0	0	†157	1119	28
20. Mrs. C. Ferguson (0), Pen-	22	27	27	25	26	29	27	17	9	6	0	0	215		26
gilly-street, Longueville :	11	25	25	21	24	25	26	15	13	22	10	19	236		28
Black Orpington.	13	18	18	19	21	26	27	25	18	19	13	4	221		27
Market Value, £6 6s. 10d	1	0	0	0	0	0	5	12	5	0	0	0	23		—
	20	26	21	20	22	28	26	10	17	21	2	11	224		24
	9	17	17	7	17	24	23	20	23	16	19	5	197	1116	24
21. A. Chick (0), Murray-road.	23	22	21	22	22	24	18	18	19	15	14	4	222		27
Beecroft : Black Orping-	5	8	23	24	26	27	21	14	14	17	18	0	197		27
ton.	0	6	13	18	14	18	12	13	17	17	9	12	149		28
Market Value, £6 1s. 10½d.	4	3	24	25	7	24	17	15	13	13	13	15	173		26
	11	13	22	19	22	22	22	11	2	13	1	2	160		24
	0	17	22	25	24	25	28	20	22	16	2	2	203	1104	24
22. C. Leach (0), Revesby P.O.,	0	0	12	24	23	25	28	15	27	9	21	11	195		30
Bankstown : Black Orp-	4	1	10	23	20	21	12	17	13	18	10	22	171		28½
ington.	3	7	17	19	19	23	26	15	24	8	16	20	197		28
Market Value, £5 9s. 5d.	0	0	17	14	25	23	27	20	28	23	10	2	189		30
	0	0	1	3	23	24	19	15	14	17	18	21	155		24
	0	0	0	11	25	26	27	21	25	22	17	19	193	1100	30
23. G. Howell (0), Brighton	17	26	19	26	18	8	3	0	1	0	1	0	119		27
Hill, Wentworthville :	9	23	21	22	25	29	23	21	19	19	12	5	228		27
Silver Wyandotte.	0	0	8	28	26	8	16	16	14	13	14	11	154		24
Market Value, £6 1s. 3½d.	0	12	25	21	14	19	19	19	15	17	11	20	192		24
	20	28	25	25	24	23	19	16	15	16	14	15	240		24¾
*	0	2	1	2	20	22	17	13	13	15	14	17	136	1069	25
24. J. H. Madrers (0), Garfield-	23	2	22	15	25	17	18	22	16	10	3	17	190		24
street, Kogarah : Black	21	17	21	24	23	22	13	18	11	15	14	12	211		29
Orpington.	12	14	21	22	16	11	14	5	16	7	4	4	146		28½
Market Value, £6 5s. 0¼d.	6	27	23	27	25	13	24	13	12	18	15	9	212		28½
	17	24	14	18	17	1	0	0	0	0	0	0	91		27
	0	9	23	24	26	26	27	15	23	14	12	13	212	1062	27
25. Mrs. J. H. Jobling (0),	26	21	0	22	18	22	18	14	15	8	9	17	190		24
George-street, Plattsburg :	6	21	11	22	10	19	19	14	13	14	11	6	166		25½
Black Orpington.	5	22	21	21	24	23	23	10	11	15	13	0	188		24
Market Value, £5 17s. 9d.	0	14	27	23	26	25	26	12	5	12	10	4	184		24
	0	24	10	18	22	27	17	4	25	17	13	3	180		26
	0	14	8	7	24	18	17	13	16	10	5	12	144	1052	24
26. J. F. Dalrymple (1).	1	22	22	19	20	18	23	7	15	15	14	6	182		30
Loloma, Forest-rd., Peak-	0	14	19	21	22	12	17	16	14	12	7	17	171		28½
hurst : Rhode Island Red.	0	17	24	23	24	22	23	19	16	13	11	12	204		30
Market Value, £5 15s. 7d.	0	0	17	23	26	14	13	11	14	11	10	1	140		30
	15	4	19	17	14	15	18	15	15	11	9	13	165		27
	21	24	21	24	24	10	17	15	0	0	0	0	†156	1018	29
27. L. V. King (0), Windsor :	0	16	12	8	20	18	16	16	15	12	13	12	158		24¾
Red Sussex.	3	0	21	22	20	15	8	5	2	2	9	7	114		25
Market Value, £5 1s. 11d.	12	4	0	4	21	23	16	17	17	11	0	0	125		24
	0	12	20	22	22	22	28	17	19	20	11	1	194		25¼
	0	0	13	21	22	24	25	22	24	19	22	16	208		27
	0	0	16	17	21	24	26	21	25	9	15	13	187	986	27
28. Allan Barton (1). Quaker's	1	7	22	13	21	24	22	7	18	1	0	3	139		24
Hill : Rhode Island Red.	13	14	9	15	15	20	21	20	24	20	9	0	180		24
Market Value, £5 7s. 9d.	20	20	18	17	20	22	19	19	11	7	12	10	195		30
	11	21	22	22	22	22	27	1	0	7	0	2	†157		27
	4	2	1	2	21	18	20	17	23	17	6	0	131		27
	16	17	12	19	20	21	24	21	16	0	11	0	177	979	28½
29. H. W. Evans (1), Edwards-	0	13	28	21	21	26	28	26	18	17	16	10	219		27
road, Wahroonga : Rhode	18	23	16	23	23	24	25	14	14	10	11	6	207		27
Island Red.	0	0	2	0	0	0	0	0	0	0	0	0	2		—
Market Value, £4 11s. 7d.	0	13	21	26	24	26	25	15	17	20	10	12	218		27
	15	23	23	22	19	26	26	7	5	0	0	0	†166		25½
	0	0	1	0	0	0	0	0	2	0	0	0	3	815	—
30. J. J. Peveley (0), Davis-rd.,	0	12	22	24	25	27	26	27	14	12	22	15	226		32
Salt Pan, Bankstown :	3	12	0	7	8	1	1	0	3	3	5	0	43		28
Black Orpington.	0	17	16	26	7	20	19	17	13	13	13	12	173		32
Market Value, £4 5s. 4¾d.	8	4	18	15	18	11	7	0	0	0	0	0	81		27
	0	18	22	13	16	18	14	14	8	10	10	10	162		30
	0	2	10	12	13	7	8	3	5	2	0	2	64	749	31½

* Bird replaced; score struck out. † Bird died; not replaced.

Progress in the New South Wales Dairying Industry.

M. A. O'CALLAGHAN.

It may be of interest to give a table showing the quantity and quality of butter manufactured in New South Wales butter factories during the months of October, November, December, January, and February last :—

Month.	Choicest.	First Grade.	Second Grade.	Total.
	lb.	lb.	lb.	lb.
October, 1916	4,793,561	1,269,439	314,368	6,377,368
November, ,, ...	5,721,701	1,621,860	395,573	7,739,134
December, ,, ...	6,509,332	1,686,888	603,529	8,799,749
January, 1917	7,044,176	1,925,398	755,032	9,724,606
February, ,, ...	6,396,261	1,566,151	471,671	8,434,083
Total	30,465,031	8,069,736	2,540,173	41,074,940

Worked on a percentage basis, the figures for each grade are as follows :—

Month.	Choicest.	First Grade.	Second Grade.
	per cent.	per cent.	per cent.
October, 1916	75	20	5
November, ,, ...	74	21	5
December, ,, ...	74	19	7
January, 1917	72·4	19·8	7·8
February, ,, ...	75·8	18·6	5·6

It will be seen that, whereas for the quarter ended 30th September, 1916, the total butter manufactured in factories amounted to 11,542,161 lb. (*see* December issue), the total amount for the quarter ended 31st December amounted to 22,916,251 lb., while the month of January, 1917, still showed an increase over any previous month.

No better indication can possibly be given of the uniformly good season the State has experienced than the regular increase which has taken place monthly in the production of butter during the summer. It is very satisfactory to note that, notwithstanding the great increase in quantity which has occurred, the quality has been well maintained. To have 72 per cent. of Choicest butter in the month of January is rather a credit to our factories. Of course, it must be borne in mind that a certain quantity of this butter, marked Choicest, has not been found exactly true to grade; but the quantity is so small that it would not materially affect these figures.

When the Dairy Industry Act was passed, opponents of the Act and pessimists generally stated that it would be impossible to raise the standard of our butter sufficiently to enable Sydney to get enough butter of a Choicest or 93-point standard. It is shown that not only has this been done, but, in addition, we have had available for export butter of a quality considerably better than we have ever previously exported from New South Wales in any quantity. During the period under review, 81 per cent. of butter exported was first-class or better.

Results for February.

Hitherto February has been regarded by factory managers as the most trying period of the year. Especially was this the case on the North Coast, where it is generally a hot rainy month, affording the very best conditions for the rapid deterioration of cream by bacterial agency. The manager of one large concern in the north stated that he would not give any opinion as to how the Dairy Industry Act had improved the quality of the cream locally, until February was over. Since then he has informed me that he is quite satisfied, and that the improvement shown in the cream delivered to factories has been far in excess of what he anticipated. The Richmond River farmers, from this viewpoint, are to be commended for their efforts towards the production of a cream of the very best quality. Care in storage and transit have, no doubt, helped the quality of their cream materially.

The figures show that February was actually better than January from a quality point of view, taking the whole State into consideration. If our farmers, factory managers, and others keep striving in the same direction—namely, that of improved quality—our industry should be able to hold its own after the war, despite the large extent to which margarine is now monopolising what was formerly the English butter trade. We must, however, improve matters still further before we can consider ourselves actually on a safe basis. What I am particularly pleased with, however, is the fact that our butter is now quite equal to that produced in any other part of the Commonwealth, and probably from an export point of view it is even superior, inasmuch as such a very large percentage of our butter is made from pasteurised cream, which gives it a keeping quality that enhances its value from an export viewpoint. The high standard of 93 points to represent our Choicest butter, as against 90 points formerly, has been the means of commercially compelling every butter factory to put in a pasteurising plant as soon as it was conveniently possible after the Act came into operation. The factory managers of New South Wales can now point with some pride to the statistical position which their butter occupies as regards quality, when compared with that of any other Colonial butter, not excepting even New Zealand.

It is a noteworthy fact that almost every manager in the industry who has been questioned on the point has stated that since the passing of the Dairy Industry Act the farmers have supplied a better cream, owing to the fact, mainly, that they were informed that they must take greater care, as the managers were compelled to strictly grade the cream, and that they must not mix, for manufacturing purposes, creams of different grades.

It is estimated that the value of the butter produced in butter factories for the quarter ended 31st December, 1916, amounted to about one and three-quarter millions sterling. Considering that there has been a material development in cheese-making and an increase in condensed milk manufacture, it will be recognised, when we realise the value of young dairy stock, that the dairying industry represents big figures for the year 1916.

The butter exported for the five months under review was worth over £2,000,000.

Manufacture of Margarine.

Returns obtained under the Dairy Industry Act show that about 70 tons of margarine are at present manufactured per week in New South Wales. This industry has shown considerable development of recent years, and Sydney is now a large manufacturing centre for margarine, a good deal of which is supplied to other States in the Commonwealth.

With the improvement in this commodity, farmers and all concerned in the butter industry will have to do their very utmost, and adopt the most scientific measures possible, to maintain the dairying industry in a satisfactory condition from a paying point of view. It is worthy of note that quite a number of factories in New South Wales are either being rebuilt or improved considerably in structure, so as to enable pasteurising plants to be installed and butter of the best quality to be manufactured. In a few months it is expected that it will be a rare thing to find a New South Wales butter factory that has not installed a pasteurising plant for the treatment of cream on the most advanced scientific lines.

Progress in Knowledge.

As showing the progress that has been made in knowledge of recent years, it is only necessary to point out that 141 people have attended the Dairy Science Schools and obtained permits in cream grading. In addition to these, a large number of others who attended, and failed to get permits, have improved their knowledge considerably, and will no doubt eventually attain to the standard necessary to entitle them to grade cream under the Dairy Industry Act.

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.

Dairy Farming on the Yanco Irrigation Area.

M. A. O'CALLAGHAN.

In previous issues I have dealt with the possibilities of dairying at Yanco. References were also made to certain drawbacks regarding some classes of farms as far as dairying was concerned; and the greatest stress was laid on the point that a dairy farmer, to have the fullest success on those areas, should have his irrigable land close to or adjoining a certain amount of non-irrigable land, which he could use for pasturing his cattle during the spring and early summer, and also as a place on which to turn out his cattle for periods when watering was being carried on over a large portion of his irrigated land.

The results of the last two years show that the statements made in the articles referred to, and the conclusions to be drawn have been borne out by all those dairy farmers whose areas were suitably designed for the carrying on of this industry.

A Personal Experience.

As pointed out in previous articles, a Demonstration Farm in connection with dairying was run at Yanco at my own expense, and worked through a local manager. For some reason, statements have been made in many directions to the effect that I had abandoned dairying on the Demonstration Dairy Farm at Yanco; and in a report of a lecture delivered by an organising agent on the Hunter River, it was stated that I took up a farm at Yanco, but that I quickly abandoned dairying there. As this statement is calculated to do a certain amount of injury to the Irrigation Areas—being a factor that would weigh in the minds of those who had an idea of taking up land there for dairying—it is here pointed out that the farm referred to has been run by me for nearly four years now, and that it is still in process of development. Before it is possible to know the best lines on which to develop an irrigation farm for dairying in a new district, it is an absolute necessity to find out what grasses and forage crops will do best under the circumstances prevailing. It takes some time to ascertain this, and the man who has any common sense will await the results of his early experiments, before going in largely for the laying down of pastures which may or may not prove successful. My experience so far goes to show that Rhodes grass and *Paspalum dilatatum* are the best summer grasses for this area for dairying. In addition to having these grasses sown separately, I have mixed Rhodes grass with lucerne, and though the Rhodes grass will probably kill out the lucerne in a few years, the mixture for the first two seasons has been very useful. The lucerne comes along very much earlier than the Rhodes grass, and grows later in the summer. By working the land with a spring-tooth cultivator in the late autumn, I expect to be able to keep the Rhodes grass from killing out the lucerne for some time. One of the great values of paspalum, in addition to its succulent qualities for dairy cows, is that it covers the soil so well in the hot summer months that the land does not cake nearly so much as it would do after the watering, if a weaker grass was used for pasture. An advantage in connection with this, and not an inconsiderable one, is the effect which a covering of this kind has in preventing injurious salts from being deposited on the surface of the soil.

As a proof of the statements made in reference to the continuity of dairying on my farm, the following returns, which were obtained for the past year, are published:—

1916.	Butter.	Value.
	lb.	£ s. d.
January	941	47 2 2
February	847	43 19 10
March	886	44 6 6
April	647	32 7 1
May	706	38 5 9
June	530	29 4 3
July	503	34 12 9
August	765	44 13 2
September	1,015	59 9 4
October	1,163	69 3 2
November	991	59 17 11
December...	1,171	70 3 6
Total	10,165	573 5 5

The value of the separated milk, in addition to above, may be put down at 1½d. per gallon, for stock feeding during the last year.

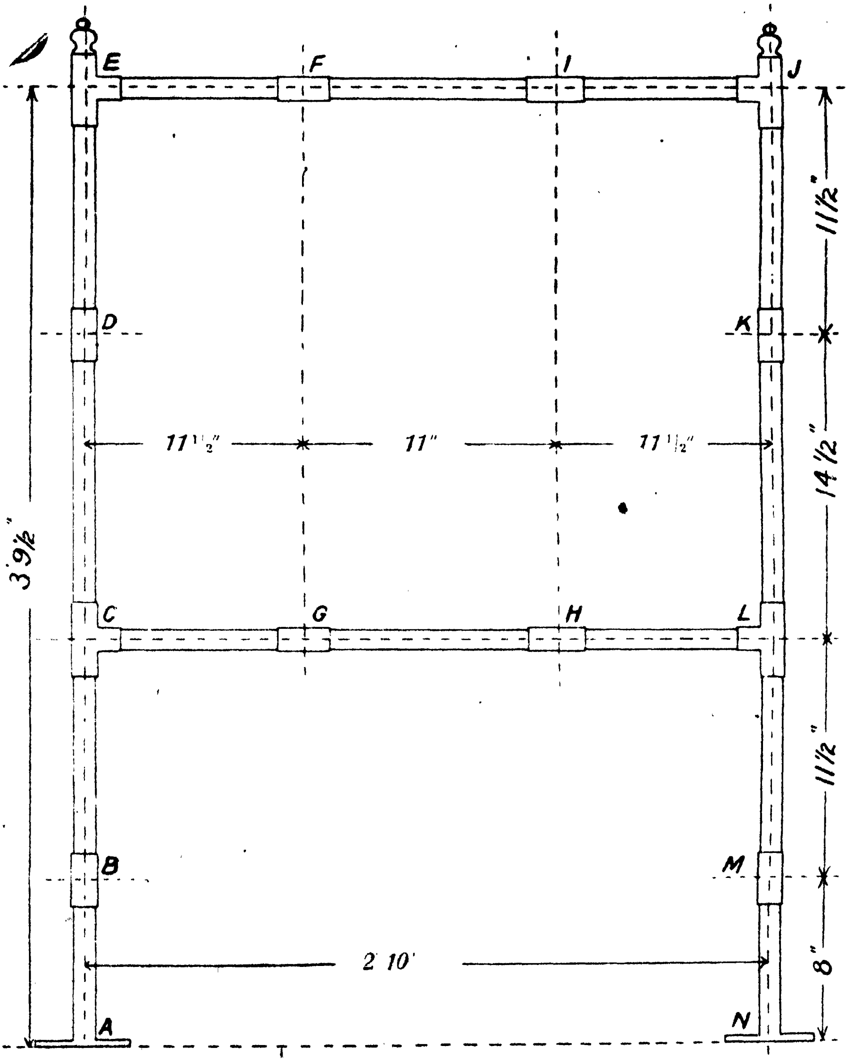
The size of the farm from which these returns were obtained is 102 acres of irrigable land, with a dry run of 150 acres. In addition to the milk sent to the factory, a fair amount of new milk has been used for stud cattle, and as all young stock are kept, the number of cattle carried is out of proportion to the number in milk, as compared with what is met with on ordinary dairy farms. This, however, has been balanced to some extent by agisting some of the young and dry stock on lands owned by the Commission and available for such purpose.

I estimate that the farm has not yet reached more than two-thirds of its carrying capacity, as there are about 40 acres to be laid down under lucerne, which are now being prepared for this purpose. Some of this land, which is the best on the farm, has carried lucerne which was planted about twelve years ago, but this now wants renewing.

It is understood that there will be a considerable rearrangement of many of the farms on the Irrigation Areas, owing to the areas at first determined upon being too small. When this is done there should be a number of additional farms suitable for dairy farming; and the industry has done so well in the hands of those who had had previous experience of any note, that it is expected that there will be quite a strong demand for these lands.

CAN RACK FOR BUTTER FACTORIES.

THE attached sketch illustrates the end-on view of a rack used at the Aberdeen Butter Factory for the empty cream cans after washing. The sketch was drawn by Mr. W. Benn, of the Aberdeen Chilling and Freezing Company's works, under whose supervision the new butter factory was built. The idea was suggested by myself, and was carried out by Mr. Benn, and it may prove suitable for other factories. Subsequent experience has led to slight modifications.



End Header of Galvanised Iron Can Rack.

A, N—1 inch flanges. B, C, D, E, F, G, H, I, J, K, L, M—1 inch Tee pieces.

For intermediate headers substitute crosses for tees at points B, D, E, G, H, I, K, M.

Being all of galvanised piping it is easily kept clean, and is impervious to moisture. It admits of plenty of drainage and fresh air for the cans. The top of the can rests on the lower bar B, and leans against the upper bar G; then another row rests on the bar D, and leans against F, and similarly on the other side M and H, K and I. If required, another tier could be placed above, so that the rack could carry three rows of cans, one above the other, by extending from J and E.

The sections can be made long or short. At Aberdeen the headers are placed 5-ft. 6-in. centres, but for larger factories the section might be 7 feet 6 inches long, as this length will carry a convenient number of cans of any size. The steel cans used mostly now are approximately of the following diameter, viz.:—

10-gallon = 15-inch diameter.
8-gallon = 13-inch „
5-gallon = 12-inch „

Thus five 10-gallon cans, six 8-gallon, and seven 5-gallon cans will fit nicely into the 7-ft. 6-in. section.

Anything longer than two 5½-ft. or 7½-ft. divisions in the one section would be undesirable; it would be better to have two or three short sections to enable a man to walk between them and so get at both sides easily.—F. WIGAN, Dairy Instructor.

PLANT BREEDING ON FARMS.

THE Plant Breeder of the Department is anxious to get into touch with farmers or sons of farmers who have sufficient interest in plant breeding work to save promising heads or plants of wheat that occur among their own or neighbouring crops. When it is remembered that Steinwedel, Dart's Imperial, and other varieties of merit have originated in this way, the value of selection in this direction becomes apparent. It is proposed that such selections be sown by hand on the farms where they have been discovered, in comparison with the wheat at present best suited to the district. When thus tested and found to be promising, a new variety could be sown with the seed drill in the farmers' plots under the supervision of the District Inspector. If those who have a liking for this work of selection will communicate with the Plant Breeder, he will advise as to the best method of conducting the tests.

LIST OF FACTORY-MANAGERS AND TESTERS WHO HAVE OBTAINED CREAM GRADING AND MILK AND CREAM TESTING PERMITS.

IN addition to the lists previously published, the following have passed the necessary examination in the grading of cream and the testing of milk and cream, and are entitled to practise such work at butter factories in accordance with the "Dairy Industry Act" and Regulations:—

GRADERS.

Name and Address.

Mr. W. L. Atkinson, Hawkesbury College, Richmond
H. J. Ainsworth, Binna Burra
T. W. Barber, Bemboka
E. T. Boller, Candelo
J. Blanchfield, Jamberoo
H. J. Bryen, Barrengarry
G. Burrows, Dungog Co-op. Dairy Co.
R. B. T. Brierley, Gleniffer
M. Burt, Goulburn
D. Blunt, Muswellbrook
J. F. Burns, Coraki
A. C. Cox, Ballina
H. J. E. Cox, South Lismore
P. Cox, Dungog
H. Clark, Cobargo
A. Cheers, Murwillumbah
F. G. Chambers, Uki
F. Coman, Nimbin
B. J. Chapman, Armidale
J. Cleary, Tamworth
W. H. Downes, Yanco Butter and Cheese Factory
C. Debenham, Frederickton
C. Dunlop, Ulmarra
D. J. Dinneen, Coramba
W. Durreen, Robertson
J. W. Evans, Copmanhurst
R. V. Falkner, Pambula
J. L. Fischer, Port Macquarie
J. Freer, Jerry's Plains
C. P. Greenwood, Hawkesbury College, Richmond
A. Gottardo, F.F. and Ice Co., Sydney
J. A. Grant, Wingham
J. Graham, Port Macquarie
W. A. B. Gibson, Sydney
F. Gibbs, Cootamundra
R. L. Hough, Grafton
A. Hart, Palmer's Island
H. W. Huskie, Albury
W. H. Hazelton, Dunoon
P. T. Johnson, Bega
W. H. Jackson, Coraki
P. Johnson, Kempsey
K. Kenny, Darlinghurst
J. P. Kenny, Tamworth
T. Kennedy, Tweed Heads
E. W. Lukins, Maclean Butter Factory
J. A. Lyons, Albion Park
W. Langton, Gerringong
H. J. Legge, Glen Innes
L. G. T. Moreing, Towamba

Name and Address.

Mr. R. W. Marshall, Pambula
R. L. Morris, Smithtown
A. J. Morgan, Ballina
A. Marshall, Coff's Harbour
E. H. Munn, Gunnedah
O. E. Middlemiss, Kendall
S. Martyn, Murwillumbah
J. McKenzie, Byron Bay
D. McCowan, Byron Bay
H. McVeigh, Bega
J. E. McNaughton, South Wolumla
N. McKenzie, Maclean
I. McIlrath, Murwillumbah
A. R. McPhillips, Smithtown
T. W. Napthali, Tweed Heads
G. Nethery, Armidale
J. E. O'Neill, Berry
C. R. O'Connor, Wyangarie
C. Poynting, Byron Bay
W. A. Paviour, Morpeth
W. Penhey, Lismore
H. Raftery, Albion Park
G. Reed, Tenterfield
R. Robson, Toorooka
J. H. Rush, Jindabyne
A. Robinson, Bemboka
G. J. Rohr, Wagga
E. Soper, Berry
C. W. Smith, Alstonville
W. S. Smith, Wilde's Meadow
G. Searl, Dungog
F. J. Schaumann, Ulmarra
C. Skelly, Scone
J. E. Staples, Port Macquarie
W. H. Smith, Crookwell
S. Simmons, Grafton
G. S. Stokes, Jones' Island
S. Smith, Richmond
A. E. Sweaney, Inverell
B. A. Thorpe, Hawkesbury College, Richmond
T. Topham, Goulburn
F. V. Veness, Menangle
E. F. Voysey, Bellinger
P. Waller, Hawkesbury College, Richmond
F. Wilkinson, Mallanganee, Richmond River
M. M. Wade, Kempsey
F. Wigan, Mayfield, Newcastle
J. C. Wilson, Lismore
J. G. Watts, Nowra
G. H. Young, Raleigh.

TESTERS.

Name and Address.

Mr. J. Armstrong, Cooper's Shoot, Byron Bay
H. J. Ainsworth, Binna Burra
E. K. Allen, Quirindi
C. Barber, Jingellic
R. B. T. Brierley, Gleniffer
T. W. Barber, Bemboka
A. J. Boxsell, Wangaruka
G. Burrows, Dungog
A. Beatty, Bega
E. Boxsell, Tilba Tilba
E. J. K. Boxsell, Tilba Tilba
A. A. Bishop, Eurobodalla
John Brown, Bodalla
M. Burt, Goulburn
S. Blunt, Singleton
H. Cotterell, Alstonville
W. J. Cotterell, Coff's Harbour
W. J. Clarke, Cathcart
A. J. Capel, F.F. & I. Co., Ltd., Sydney
E. F. Coman, Nimbin
*F. G. Chambers, Channon
†A. Cheers, Murwillumbah
B. J. Chapman, Armidale
J. P. Carroll, Muswellbrook
V. J. Cork, Narooma
A. E. Clark, Bergalia
†O. E. Corlis, Ballina
†H. Chamen, Macksville
— Cranswick, Byron Bay
A. H. Chambers, Black Mountain
G. F. Dening, Tyalgum
C. Dunlop, Ulmarra
D. J. Dinneen, Coramba
J. D. Daley, Alstonville
C. Debenham, Frederickton
F. T. Drury, Inverell
A. V. Dalby, Leeton
W. Durreen, Robertson
A. T. Ellis, Ballina
W. J. East, Tenterfield
H. L. Glover, F.F. & I Co., Ltd., Sydney
A. H. Groves, Singleton
*A. Gottardo, Sydney
J. A. Grant, Wingham
W. A. B. Gibson, Sydney
F. Gibbs, Cootamundra
P. H. Golding, Canowindra
W. Heather, Uki
V. C. Hale, Manly
R. L. Hough, Grafton
A. Hogan, Bomaderry
R. A. Hunter, Macksville
C. H. Hutchings, Bergalia
E. Hawkins, Purfleet
†W. J. Henry, Coff's Harbour
H. W. Huskie, Albury
L. Haigh, Pambula (Theory only)
A. R. Higgins, Homebush
J. T. Hammond, Tamworth
W. F. Heydon, Glen Innes
W. H. Hazelton, Dunoon
C. Irwin, Moruya
D. H. Johnson, Unanderra
P. J. P. Kuhre, Cobargo (Certificate)

Name and Address.

Mr. K. Kenny, Darlinghurst
J. P. Kenny, Tamworth
Nacloj Kuhre, Cobargo (Certificate)
S. C. Kitt, Uki
John Kenny, Tamworth
F. W. Lambert, South Lismore
W. Langten, Gerringong
*C. W. Lattimer, Dorrigo
H. J. Legge, Glen Innes
A. Livingstone, Central Tilba (Certificate)
R. W. Marshall, Pambula
W. Maynard, Kangaroo Valley
E. Middlemiss, Kendall
A. Marshall, Coff's Harbour
E. H. Munn, Gunnedah
N. McKenzie, Maclean
C. McDonald, Bega
F. McGovern, Goulburn
†J. McKay, Bowraville
L. R. McPherson, Nimbin
E. H. McDonald, Tumut
I. McIlrath, Murwillumbah
C. W. McKenzie, Tweed Heads
*J. McDonald, Aberdeen
G. Nethery, Armidale
J. E. O'Neill, Berry
C. R. O'Connor, Wyangarie
R. J. Oldfield, Coraki
W. A. Paviour, Morpeth
†W. Paull, Tamworth
H. J. Parbury, Moruya
S. S. Perry, Corunna
A. Richins, Bega (Certificate)
C. J. Robinson, Cathcart
G. J. Rohr, Wagga Wagga
T. Robinson, Black Mountain
E. H. Rankin, Kiora
R. Robson, Toorooka
J. H. Rush, Jindabyne
A. Robinson, Bemboka
E. D. Soper, Berry
C. W. Smith, Alstonville
O. H. Smith, Berry
G. Searl, Dungog
E. W. Simes, Kyogle
F. J. Schaumann, Ulmarra
*T. W. Smith, North Sydney
C. Skelly, Scone
O. Scott, Denman
C. A. Swain, Moruya
B. R. W. Searl, Singleton
F. V. Veness, Menangle
E. F. Voysey, Bellinger (Certificate)
F. Wilkinson, Casino
N. Wilshire, Bangalow
J. E. Wiley, Berry
W. Wallis, Cessnock
F. Whyte, Quirindi
F. R. Webb, Wyong
O. Wrightson, Corunna
A. Wade, Kempsey
V. H. Young, Byron Bay
G. H. Young, Raleigh.

* Milk Testing only.

† Cream Testing only.

Official Milk and Butter Records.

M. A. O'CALLAGHAN.

THE records published herewith show some very satisfactory performances.

The records put up by three of Mr MacDonald's "Ingleburn" herd of Jerseys are extremely creditable, as is the record of Mr. Hordern's imported cow, "Plymouth Lady."

The milking records of the three Darbalara Shorthorns, combined with high butter yields, are also worthy of note.

The record of Mr. Pritchard's Ayrshire cow "Lady Lucy" is also a good evidence of the capacity of this breed of cattle.

Those interested in these records will pay special attention no doubt to the notes given in connection with the feeding of each herd. For cows fed on pastures only, Mr. Young's Shorthorns have put up a very good average.

Scottish-Australian Investment Co.'s Darbalara Milking Shorthorns.

Name of Cow.	Age at beginning of test.		Date of last Calving.	Totals.				Yield on last day of test.	
				Milk.	Butter.	Butter fat.	Average test.	Milk.	Butter.
	yr.	mth.	1916.	lb.	lb.	lb.	%	lb.	lb.
Treasure II	9	0	20 Jan. ...	9,654	415	347	3·6	27	1·22
Melba III	11	0	16 Feb. ...	9,909	402	326	3·3	4½	0·26
Minnie VIII	5	0	29 „ ...	9,217	429	356	3·8	18	1·02

In addition to such pasture as was available, Melba III and Minnie VIII received 3 lb. each of boiled corn and bran and 6 lb. oaten chaff; Treasure II was fed on pastures only.

Mr. J. T. Young, Bangalow, Milking Shorthorns.

Name of Cow.	Age at beginning of test.		Date of last Calving.	Totals.				Yield on last day of test.	
				Milk.	Butter.	Butter fat.	Average test.	Milk.	Butter.
	yr.	mth.	1915.	lb.	lb.	lb.	%	lb.	lb.
Pet II	8	0	8 Dec. ...	7,992	392	327	4·1	14	0·80
			1916.						
Judy	8	0	17 Jan. ...	8,640	443	362	4·2	23½	1·17
Star II	5	0	10 Feb. ...	8,484	411	337	4·0	26	1·31
Emerald	4	0	23 „ ...	9,522	417	342	3·6	24	1·07
Pride	6	0	20 „	7,296	309	255	3·5	10	0·51
Stately II	5	0	2 „ ...	8,235	336	271	3·3	23½	0·99
Empress II	3	1	7 May ...	8,151	379	309	3·8	25½	1·25
Fussy	......		25 „ ...	8,461	400	338	4·0	18	0·87

Cows fed on pasture only.

Mr. S. Hordern's Jerseys, Retford Park, Bowral.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Totals.				Yield on last day of test.	
			Milk.	Butter.	Butter fat.	Average test.	Milk.	Butter.
	yr. mth.	1916.	lb.	lb.	lb.	%	lb.	lb.
Aster (imp.), 1,537	6 11	31 Jan. ...	6,589	386	322	4·9	19½	1·28
Retford Snowdrop, 67 ...	2 6	25 ,, ...	6,595	401	336	5·1	19½	1·35
May Panora (imp.), 2,315 ...	6 10	25 Feb. ...	7,771	484	404	5·2	25½	1·89
Javas Valentine (imp.), 2,111	7 2	25 Mar. ...	6,594	427	356	5·4	21½	1·51
Welcome (imp.)	2 10	19 April...	5,794	324	272	4·7	16	0·86
Coulisse 15th (imp.)	8 1	28 ,, ...	6,070	413	345	5·7	17½	1·22
Watkin's Plymouth Lady (imp.).	6 1	6 May ...	7,515	505	413	5·5	23½	1·70
Retford Trentic, 3,071 ...	4 0	22 April...	4,341	290	238	5·5	11½	0·85

In addition to pasture feed the cows received from February to May 4 lb. lucerne chaff, 3 lb. bran and 2 lb. oats; from May to July 10 lb. oaten chaff, 2 lb. lucerne chaff and 6 lb. bran; from July to November 10 lb. oaten chaff, 6 lb. bran; during November, pasture only; and in December 8 lb. bran. 10 lb. oaten chaff.

Mr. C. R. G. MacDonald's Jerseys, Ingleburn.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Totals.				Yield on last day of test.	
			Milk.	Butter.	Butter fat.	Average test.	Milk.	Butter.
	yr. mth.	1915.	lb.	lb.	lb.	%	lb.	lb.
Maitland Queen of St. Lambert, 3,084.	3 10	18 Aug. ...	9,778	582	479	4·9	29½	1·84
Maitland Vanilla	1 10	4 ,, ...	5,443	332	272	5·0	19	1·17
Exile's Brighton Queen, 3,080	2 9	9 ,, ...	10,845	594	488	4·5	35½	2·11
Maitland Petal	1 10	23 July ...	4,120	298	251	6·1	12	0·96
		1916.						
Brighton Zingara, 3,079 ...	4 8	4 May ...	10,107	546	444	4·4	31½	1·54

In addition to pasture feed, each cow received daily 2 lb. each of bran, pollard, maize meal, linseed oil meal, and 4 lb. of lucerne chaff.

Mr. J. R. C. Davies' Jerseys, Puen Buen, Scone.

Name of Cow.	Age at beginning of test.	Date of last Calving.	Totals.				Yield on last day of test.	
			Milk.	Butter.	Butter fat.	Average test.	Milk.	Butter.
		1916.	lb.	lb.	lb.	%	lb.	lb.
Puen Buen Needle V... ...	......	1 Feb. ...	4,764	323	238	5·0	16½	1·18

In addition to pasture feed, the cow received 20 lb. ensilage and 6 lb. bran daily.

Mr. Jas. Pritchard, Numba.

Name of Cow and Herd-book No.	Age at beginning of test.		Date of last Calving.	Totals.				Yield on last day of test.	
				Milk.	Butter.	Butter fat.	Average test.	Milk.	Butter.
Jersey.									
	yr.	mth.	1915.	lb.	lb.	lb.	%	lb.	lb.
Silvermine	10	0	21 Dec. ...	6,138	365	300	4·9	20	1·41
Ayrshires.									
			1916.						
Lovely of Kabibinokka ...	7	0	11 Jan. ...	6,690	385	321	4·8	23	1·38
Lady Lucy of Kabibinokka, 3,039.	7	5	22 April...	9,606	433	355	3·7	34½	1·81
Jean of Kabibinokka, 3,038...	2	9	26 ,, ...	7,842	409	337	4·3	31	1·76

Pasture only.

Mr. E. P Perry, "Nundorah," Parkville, Guernseys.

Name of Cow and Herd-book No.	Age at beginning of test.		Date of last Calving.	Totals.				Yield on last day of test.	
				Milk.	Butter.	Butter fat.	Average test.	Milk.	Butter.
	yr.	mth.	1916.	lb.	lb.	lb.	%	lb.	lb.
Tulip of the Haut Chemin (imp.).	5	2	30 Jan. ...	5,950	315	261	4·4	17½	0·93
Mignonette VII (imp.) ...	6	8	1 Mar. ...	6,105	358	283	4·8	22½	1·32
Eugenie of Nundorah, 46 ...	2	5	24 ,, ...	4,060	223	186	4·6	12	0·79
Golden Hope (imp.) ...	2	3	17 ,, ...	4,753	250	209	4·4	13	0·79

In addition to pasture feed, Tulip of the Haut Chemin received for February 6 lb. bran, 6 lb. cracked corn and 2 lb. molasses; for April 6 lb. bran, 4 lb. molasses; for May 7 lb. bran; for June and July the same as April. Mignonette VII received for March and April 7 lb. bran, 1 lb. cracked corn; for September 15 lb. turnips and 5 lb. bran. Golden Hope received for September 10 lb. turnips and 5 lb. bran, and for November 5 lb. oaten chaff.

AFTER consultation with the Department of Agriculture, the Principal Librarian, Sydney, has decided to establish a library for the circulation of agricultural literature amongst the various branches of the Agricultural Bureau. Several sets of about thirty books, each dealing with all departments of agriculture and allied subjects, are now available for loan to branches, and secretaries whose members desire to participate in the advantages of the circulation should make application to the Principal Librarian, Sydney.

Poultry Notes.

MAY.

JAMES HADLINGTON, Poultry Expert.

THE advice given last month in regard to the preparation for the breeding season is repeated. Before next month's notes are in the hands of poultry-farmers the first eggs to start the hatching season should have been set; not that eggs are likely to be at all plentiful so early in the season, but what are available should be put down. The poultry farmer who fails to set all the eggs he can as early as possible after the end of this month, will miss the most valuable of the hatching season, particularly in so far as stud birds are concerned. Whatever objection there may be to setting eggs of the light breeds so early in the season to raise layers, it is certainly a mistake to neglect starting from the 1st June with heavy breeds, whether they are to be regarded as stud birds or layers. I am quite certain that a very great improvement in stamina and physique would follow a more general adoption of the policy of early hatching. If any doubt exists on this point poultry-farmers might make a general survey of the birds they have hatched in different months and note the difference in development, taking, of course, general averages and not small odd lots as a guide. If this is done they would, I feel sure, be convinced of the wisdom of the policy here advocated.

The difficulties attendant upon getting large numbers of chickens out as early as July, owing to the scarcity of eggs, poor fertility, and other obstacles to be encountered, are fully appreciated; but the policy of hatching late one year is the forerunner of the same condition the next, because of the immaturity of the young stock which would, if hatched earlier, have been fit to use as breeders in the first year. As it is to young stock we must look for the bulk of the eggs to be produced in May and June, the advisability of early hatching, notwithstanding the disabilities, should be obvious.

The Use of Hens that have Moulted Late.

It is recognised that the hens which moult late are, generally speaking, the best layers; as a matter of fact, it is because they keep on laying during the autumn that they do not moult in the proper season. This, of course, has its advantages from an egg-laying point of view, but when it comes to the selection of breeding stock there is another side to the question. Owing to these facts many poultry-keepers are led to select these late-moulting hens as breeding stock, thinking thereby to make sure that they are breeding from their best layers. This, unfortunately, is one of those truths that lead the uninitiated into error. Last year there was some controversy on this subject which brought it into prominence, and in consequence it was quite a common thing to see mated pens as late as June composed principally of hens in various stages of moult, some scarcely having started; this was carrying the late moulting idea to an absurd extreme. The result of such a practice can only end in disappointment. In the first place it is not reasonable to expect hens to undergo the strain of making their new feathers and at the same time to lay eggs sufficiently strong to produce thrifty chickens. But a greater disappointment awaits a breeder who uses these hens to breed from when a little later on (and at the time when the hatching season should be getting into swing) these hens break up, stop laying and disorganise the whole of the breeding pens. Before matters can be righted by the introduction of fresh hens, and owing to the delays incidental to the pens settling down to work again, a good deal of the most valuable part of the hatching season has been lost, partly on account of the time wasted and partly owing to the poor results that have been obtained from the eggs already set from this class of hens. It has been recognised by poultry-keepers from time immemorial that hens in the moult are not fit to breed from, nor is it in accordance with the dictates of common sense; but, unfortunately there is a tendency on the part of persons starting poultry farming to follow the latest fad instead of using their judgment.

Stale Eggs.

When eggs are scarce, as they will be in the next three months, it is with some difficulty that sufficient eggs can be got together to fill the incubators; operators are likely to risk saving their eggs up too long. It should be understood that while eggs three weeks old, if kept out of draughts, and turned occasionally, will, other things being favourable, hatch satisfactorily when set under hens, this is not the case, however, in regard to eggs for incubators, which should not be kept more than a week before being set; therefore the operator should endeavour to arrange his incubator capacity accordingly.

The Need for Preparation.

If the lessons of the last hatching season have not been entirely lost upon poultry-farmers there will be better preparedness for the coming one. It is generally acknowledged that scores of thousands of chickens were lost last season owing to the inadequate equipment provided for rearing them.

It has been constantly pointed out in these notes that the old order of things in poultry keeping, as in other pursuits, is passing away, and the muddling along which was such a conspicuous feature of the past is giving place to a more systematised procedure in all departments. This is particularly the case in regard to rearing the chickens, which is the foundation of success.

A change for the better is certainly coming over the poultry industry; evidence of this is to be found in the number of new plants being built on systematic lines, and many old farms are introducing modern methods. All this, of course, requires capital; but once it is realised that poultry-farming is capable of returning a fair interest on capital, which under the management of persons with the necessary experience it is capable of doing, then some of the difficulties will be overcome. One of the real difficulties to be met with at the present time is the dearth of men who really understand poultry-farming in the sense of running it as a business. There are numbers of persons who consider they understand poultry-farming, but alas! only too many have embarked capital in it on the strength of some of their assumptions. There is a great gulf between keeping a few poultry and poultry-farming as a properly organised business.

However, want of information can scarcely be pleaded as an excuse for not attempting to improve one's methods, although want of capital to a certain extent may be; but even in this case the same argument applies. If the amount of capital available is only equal to making provision for 100 chickens and their ultimate accommodation, it is the height of folly to attempt to rear 500, which unfortunately is only too often practised, with disastrous results in rearing. If the ill effects attendant upon this practice ended simply with the loss of so many chickens it would be bad enough, because each chicken hatched should be worth at least a shilling. Unfortunately it does not end here, and when such losses are sustained the survivors are to a very large extent ruined as far as making profitable stock is concerned.

To obviate this state of things at the beginning of the season the would-be poultry raiser should attempt to sum up his requirements and position in regard to how many chickens he will attempt to hatch and rear; then he should calculate the amount of equipment necessary in the matter of brooders and rearing pens, and the ultimate adult accommodation for the birds when reared, and make all necessary plans accordingly.

AGRICULTURAL LENDING LIBRARY.

THE Principal Librarian of the Public Library of New South Wales desires that attention should be drawn to the Country Reference Section, in which parcels of from one to three reference works are lent for one month from date of issue (unless an extension of time be applied for and granted). These books are forwarded by post only, and are lent free of all charge, excepting the return postage, which must be paid by the borrowers.

The section includes a large number of valuable works on agricultural and allied subjects, such as bee culture, fruit growing, poultry farming, dairy farming, horse breeding, sheep raising, veterinary science, &c., and readers of the *Gazette* who desire to supplement their knowledge in this direction are invited to get into communication with the Public Library and obtain further details of the scheme.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Cordeaux-Goondarin.

A meeting of this branch was held on 7th March, when a paper from which the following is taken was read by Mr. A. E. Fishlock :—

THE TOMATO AND ITS CULTURE.

The varieties of tomato that have been raised during recent years show a marked improvement upon those that were in cultivation in the last decade, and the flavour has also in cases been improved. It would be difficult to find a more prolific esculent than the tomato, or one that will grow under such a variety of conditions. On the rich alluvial soils of this locality it grows amazingly, and with ordinary care and attention produces good fruit over nearly the whole of the district.

Although the tomato will grow and produce good crops on a variety of soils, provided they are deeply worked, still it does best on deep, rich, friable, virgin loam. Tomatoes should not be grown on the same land for more than two years in succession. Well decayed farmyard manure is the best fertiliser ; but failing this, commercial fertilisers that are rich in potash are beneficial. Unleached wood ashes are an excellent fertiliser for the tomato.

For an early crop the seed should be sown under glass in July, and when the seedlings are large enough and inured to outdoor temperatures they may be transplanted to their permanent positions. A bed of the required dimensions, composed if possible of light sandy soil, should be prepared in a sheltered corner of the garden. On the surface sow the seeds thinly and evenly, leaving them only lightly covered with soil. A piece of light calico or similar material for shelter should be stretched across the bed, about 2 feet above the surface. If the young plants are growing too thickly, thin them liberally ; when 3 to 4 inches high they should be sufficiently vigorous to transplant. When in the seed-bed, the young plants should be regularly and efficiently watered and kept free from weeds.

It will facilitate attention to the plants and harvesting of the fruit, if the plants are set out in rows 4 feet apart, and 4 feet apart in the rows, but on the triangular method.

The seedlings should be carefully lifted from the seed-beds and transplanted, choosing if possible cloudy or rainy weather. After the plants are set out, a 5-ft. hardwood stake should be driven into the ground near each plant, or the stakes may be set out at their proper distances before transplanting. Each plant should be trained to one stem, and as the growth advances it should be tied to the stake. When the plant has attained the height of the stake the leader should be taken out.

All that is necessary in the way of cultivation is to keep the ground loosened and weeds in check. A mulch of partially decayed manure has a beneficial effect on the plant. Should the weather be dry the plants will be benefited by an occasional copious watering.

It is well to use a good spray for fungus diseases on the tomato.

The varieties I prefer are :—Dwarf Champion, Spark's Earliana, Matchless, Burwood Prize and Chalk's Early Jewel.

Cotta Walla.

A meeting was held on 13th March, when there was a good attendance. Mr. A. Rowe read a paper comparing the returns from a crop with those from sheep.

CROP-GROWING AND SHEEP-FARMING COMPARED.

Averaging the price of chaff on the values of the last three years, Mr. Rowe took it to be worth £5 per ton, and by the same method he valued seed oats at 3s. 4d. per bushel. A crop of 25 cwt. of oaten chaff per acre would thus be worth £6 5s. The expenses he put at: Ploughing, 8s.; harrowing and cultivating, 3s. 6d.; drilling, 2s.; manure, 2s. 6d.; harrowing and rolling in spring, 1s. 9d.; reaping and twine, 7s. 6d.; stooking, 3s.; carting and stacking, 8s.; chaffing, 7s. 6d.; bags, 12s.; cartage, 5s.; total, £3 0s. 9d., which left a profit of £3 4s. 3d. per acre.

As in the previous case, the average of the past three years was accepted as the value of the sheep and the products. It was also assumed that the land would carry two ewes per acre, which would produce a lamb each. The lambs were averaged at 22s. 6d. each, and wool at 1s. 3½d. per lb. The balance-sheet was briefly as follows:—Receipts: Two lambs, £2 5s.; wool from ewes, £1 3s. 3d.; two ewes on hand, £1 10s.; total, £4 18s. 3d. Expenditure: Two ewes at £1 1s. 8d. each, £2 3s. 4d. Net profit per acre, £2 14s. 11d.

A meeting was held on 3rd April, at which Mr. G. Butt read a paper on fallowing, and Mr. L. Barbour one on artesian bores.

French's Forest.

A meeting was held on 31st March, at which a paper was read by Mr. J. W. West.

SOME MISTAKES IN POULTRY-FARMING.

Mr. West related that five years ago, in the middle of August, he made one of his greatest mistakes, being in too much of a hurry to raise a flock of chickens. He had three incubators at work—two of 100 eggs each, and one of seventy-five eggs capacity, and started to hatch a lot every three weeks. The first three weeks of hatching was all right, but the next three weeks he found himself all at sea. Having only three brooders, he had to make cold brooders with netting on the top, and, as a result of overcrowding, lost about half his chickens.

DISCUSSION.—Mr. MITCHELL thought at least six brooders were required for such a hatching as was indicated. The square corners of cold brooders should be shut off by tacking cardboard across the corners so as to get an octagonal instead of a square shape. Mr. MOBERLY thought it wiser to purchase brooders of a reliable make to correspond with the incubators used.

Glenorie.

A meeting was held on 25th February, at which, after the general business had been disposed of, a discussion took place on co-operation.

Holbrook.

A meeting was held on 10th March, at which a collection of organs of sheep affected by various diseases now prevalent in the district was exhibited. The attendance and interest shown at this meeting were the most satisfactory yet recorded. Six new members were enrolled, and further promises of support were received.

SHEEP DISEASES.

In the course of the discussion, it was agreed that attention should mainly be directed to the prevention rather than the cure of disease. In the case of foot-rot, good can be done by running the sheep through bluestone and arsenic solution as soon as symptoms appear, or even before. The practical difficulties connected with treatment for lungworm were mentioned, but as stomach and intestinal worms are usually also present, an improvement in general health can often be effected by administering a suitable arsenic drench, and indirectly the sheep may be enabled to throw off also the more inaccessible parasite. It was agreed that the condition of young sheep must be kept up at all costs. Weaners respond readily to frequent changes of paddocks, and need all the room it is possible to give them, together with a full supply of salt and tonic licks. One member stated that some sheep recently bought showed a kind of scab on the muzzle, face and ears, undoubtedly the result of grazing on trefoil.

Inverell.

The annual meeting of this branch was held on 9th March, the Chairman of the branch, Mr. J. Ditzell, presiding.

The Chairman's report showed that regular meetings had been held during the year, and several very useful papers, lectures and demonstrations had been given. The number of financial members had increased during the year. Four members had enlisted in the oversea forces. Representations had been made to the Forestry Commission in favour of an afforestation area in the district, a site in the vicinity of Warialda being suggested.

The Treasurer's statement showed the receipts to have been £9 16s. 11d., and the expenditure £8 1s., a credit balance of £1 15s. 11d. being thus left on hand.

The election of office-bearers for the year resulted thus:—Chairman, Mr. J. Ditzell; Vice-Chairmen, Messrs. G. Morton and G. H. Arkinstall; Secretary and Treasurer, Mr. W. A. Kook; Auditor, Mr. E. C. Sommerlad.

Kellyville.

A meeting was held on 31st March. Mr. W. C. Morris read a paper on poultry-keeping, which was discussed by the members, several referring to the adulteration of pollard.

Lidcombe.

On 10th February the members of this branch journeyed to Dundas to visit Mr. H. J. Rumsey's nursery, where the overhead system of irrigation had been installed. The system was examined with interest.

On 26th February Mr. H. H. B. Bradley gave a lecture on the cultivation and hybridising of bulbs, introducing many bulbs which were undoubtedly new to members.

On 12th March a lecture on potatoes was given by Mr. A. E. J. Anderson, who dealt fully with all branches of their cultivation. An assortment of potatoes, supplied by the Department of Agriculture, was exhibited during Mr. Anderson's lecture. There were fifty-eight members present, and keen interest was shown in the subject.

With a view to making the branch of practical use to the members, it has been decided to encourage the proper spraying of trees, &c., by purchasing a spraying pump and all necessary spraying materials. These will be available to the members of the branch at a nominal charge. It is also proposed to purchase lime and fertilisers in large quantities at wholesale prices, so that members may obtain the benefit of the wholesale rate.

The Secretary reports that the branch is rapidly growing, and that members show keen interest in the work. A local firm has donated a prize for the best improved orchard or garden belonging to a member.

Lower Portland.

A meeting of the branch was held on 5th March. The Assistant Secretary, Mr. G. Gosper, read a paper on maize-growing, and produced samples of three varieties, viz., Silvermine, Giant White, and a yellow variety grown in the district, known as Pale Yankee. It was agreed by those present that the Giant White was the best sample shown. The following paragraphs are from the paper:—

MAIZE.

In growing maize for the marketing of the grain, good rich soil is required to make the undertaking a success. A good average crop is 40 to 50 bushels per acre. We read of 100 bushels and over per acre being grown, but from my experience it cannot be done on the best land in this district. Although, perhaps, a quarter of an acre may yield 25 bushels, with light and everything else in its favour, and planted right to the edge of the area, it is not fair to calculate an acre on the same basis.

Even taking 60 bushels to the acre, which is more than the best averages for this district, and with the price at 3s., which is a reasonable average, maize cannot hold its own with vegetable crops in the nett returns for the year, but where a few acres of good soil are available it certainly pays well when marketed in the form of pigs and poultry. I consider 6s. per bushel can be taken as the lowest return when maize is marketed in this way. My remarks will therefore apply to the cultivation of maize for consumption on the farm.

As this locality is practically a fruit-growing district, the selection of soil is narrowed down to plots unsuitable for that purpose. The land should be ploughed not later than May to a depth of 9 inches or more, excepting swamp land, which should not be ploughed more than 5 or 6 inches. The land should not be harrowed, but left open to the frosts till August, and then ploughed again about the same depth and harrowed down straightaway, as if left open at this season it is apt to run together and form clods, which will necessitate far more work. In fact, cloddy ground in the spring cannot be got in proper order if the season is dry. If there are any signs of clods forming the roller should be used and the ground brought into tilth by using the roller and harrow alternately. The preparation of the soil is one of the main items in maize-growing, all the work after being of no avail unless the land is in fair order before planting.

In planting, different varieties require to be planted different distances apart. The quality of the soil has also to be considered. In good soil, 5 feet between the drills and 4 feet in the rows is not too far apart for the taller varieties, and 4 feet 9 inches between the drills and 3 feet 6 inches in the rows for the shorter varieties. The drills should be opened about 4 or 5 inches deep, and ploughing twice in the same drill will generally give better results in the planting and the drilling will be more even. In even soils the dropper is very satisfactory, but in mixed soils dropping by hand is preferable, as the seed can be planted thicker or thinner as the soil requires.

I prefer the white varieties on account of there being less growth in the stalk, as they can be planted closer and therefore yield better per acre. They are earlier than most yellow varieties, which is another big consideration in districts subject to floods, like the Hawkesbury. About the first week in September is time to plant. Providing the seed is sound three grains to the hole is ample. The covering of the seed depends on the condition of the soil; if it is damp very little is required, and if on the dry side more will be necessary. After planting, very little attention is required for the first few weeks. When about level with the top of the drill the roller should be used to firm the ground and break any clods. As soon as this is done the cultivator can be introduced and will do better work after the roller. A second scuffling may be necessary in a growthy season. Like all other crops, the sooner the ground is moved, and the more often in the early stages, the better the response of the plants. When about 2 feet high, all reeds and high grass that will not be smothered with the plough should be cut out, and the soil should then be backed up and cleaned out with the plough. A week or two after ploughing the harrow should be run through.

The cultivation should then be complete; I find the more cultivation after that period the lighter the crop. When the stalks begin to die and the sap in the cob begins to dry away, it is fit to feed to pigs, and I find for young pigs this is the most profitable time to feed. The stalk and husk should be well dry before the ear is pulled to store in the barn.

After the crop is gathered, the stalk-cutter should be put over the stalks and grass and the land ploughed at once, so as to give the stalks time to decay before the second ploughing. This is very important with the poorer soils, otherwise they soon wear out.

Rawsonville.

At the last meeting of this branch a paper was read by Mr. Guy Hovenden on the blow-fly pest in New South Wales. Various traps for the flies were described, and the possibilities of control by the artificial multiplication of natural parasites like the Chalcid wasp (*Nasonia brevicornis*) discussed. To the suggestion that it should be made obligatory to destroy all carcases, the objection was urged that the work would be very costly. The method of prevention most approved was crutching.

Robert's Creek.

The annual meeting of the branch was held on 4th April. A large number of members were enrolled. After the election of officers a programme committee was elected.

Spencer.

A meeting was held on 21st March. The following office-bearers for the ensuing year were elected:—Chairman, Mr. A. H. Woodbury; Vice-Chairman, Mr. E. C. Allen; Hon. Secretary and Treasurer, Mr. H. J. Woodbury.

St. John's Park.

At a meeting of this branch on 16th March a paper was read by Mr. W. Tuckey on the subject of bee-keeping. He regarded it as quite a delightful pastime, even when carried on for profit. Its most unpleasant features had been eliminated by the disappearance of the old box hive and the introduction of the modern improved hive.

Thyra and Bunaloo.

A meeting was held on 10th March, at which the offer of the Public Library to supply books on agricultural subjects was discussed. It was decided that the programme for the coming year be drawn up at an early date.

Ulan.

A meeting of the above branch was held on 17th March, at which, after the general business had been disposed of, a programme for the current year was drawn up.

Woonona.

A meeting of this branch was held on 13th March. It was decided to hold an exhibition amongst members at an early date, and a committee was appointed to make arrangements.

Mr. Fowler continued his paper on poultry for profit, dealing chiefly with the position and condition of the pens, the treatment of the runs, and the various breeds.

One new member was elected.

Yarramalong.

A meeting was held on 7th April, but owing to the holidays it was decided to defer most of the business until the ensuing meeting.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	A. J. Alcock, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Boolaroo	J. Raw, Fairfax-st., Spier's Point.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Core, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	J. Clatworthy, Millpose, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	F. A. March, Cordeaux River, Mt. Kembla.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
French's Forest	J. W. West, French's Forest.
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne	Sylvester Kennedy, Jindabyne.
Katoomba	W. E. Parry, Victoria Road, Katoomba.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Lankey's Creek (Jingellic).	—
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A. E. J. Anderson, B.A., Platform-street, Lidcombe.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	—Barkell, Meadow Flat, via Rydal.
Middle Dural	A. F. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	H. R. Parkes, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Rawsonville	Guy R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, Wyalong W.
Spencer	H J. Woodbury, Spencer.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hindef, Tallawang.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Toronto	J. Froome, Knowle Farm, Toronto.
Ulan	P.S.D. Howarth, Ulan, near Mudgee
United Peel Riv. (Woolomin).	—
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Wetherill Park	L. Rainbow, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	A. Cavill, Campbell-st., Woonona.
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yass	—
Yetholme	—
Yurrunga and Avoca.	R. Waples, Yurrunga.

Orchard Notes.

MAY.

W. J. ALLEN.

Preparation for Planting.

If the land intended for planting this season is not already ploughed and subsoiled, this work should be done at once, so that the planting of deciduous trees may be completed during the month of June. The roots of young deciduous trees, if examined, will be found to be making growth during June and July, and if planting is carried out early in the winter, this root growth enables the trees to obtain a good hold of the soil, and they make a strong top growth right from the time they commence to grow in the spring.

The selection of varieties to be planted should be made, and the order placed with the nursery without delay, if that has not already been done. In selecting ascertain varieties which sell most readily on the markets, and then select those which are most suitable for the soil and climate.

Fencing.

The orchard should be securely fenced, in order to protect it from damage by stock. Where rabbits and hares are prevalent, wire netting will be necessary. This should be sunk in the ground to a depth of 6 inches, it should not be less than 3 feet high, and the mesh should not be larger than 1¼ inch. All gates should shut closely; even with these precautions a constant watch should be kept for any rabbits or hares that may manage to get inside the fences, so that they can be destroyed before they damage the trees.

Pruning.

Owing to rust and other fungus diseases this season, the stone fruits are losing their leaf early in many districts. This will allow the orchardist to make an early start with the pruning of these trees. If this work is pushed through early, the winter ploughing can be proceeded with in good time, and it will be possible to pay full attention to the early spring spraying.

When pruning the peach, it should be remembered that it chiefly crops on the previous year's laterals, and not on old spurs; thus it is necessary to keep up a yearly supply of young laterals. This can be done if the old laterals are taken out regularly each winter pruning, when young laterals will start from the dormant eyes at their bases. Care should be taken, when cutting out the old laterals, not to cut close enough to damage the dormant eyes. In seasons when there is a bad showing of fruit eyes, it will be necessary to leave some of the two-year-old laterals, which are carrying sub-laterals, or temporary spurs showing fruit eyes, but this is to be avoided as much as possible, for the longer the laterals are allowed to remain after the second year the harder it is for the dormant eyes at the base to start into growth. If the trees have been topped the previous pruning, it will probably be necessary for a number of leaders to be thinned out this season, for if the top is allowed to become too thick the trees will not furnish fresh laterals along the main branches too readily. It has also been found that in very vigorous trees which have their shape well established, it is well to only thin the leaders out and not top them back for a season. This non-topping also encourages the furnishing of laterals below.

The apricot crops both on the previous year's laterals and on older spurs, but on most varieties the tendency is for these spurs to die out after two or three seasons, starting from the base of the lateral; consequently the laterals soon only produce fruit towards their tips. This may be avoided by following a system of renewal very similar to that described for the peach. Plums, on the other hand, mostly develop permanent fruiting spurs. These can generally be obtained by leaving the laterals long in the trees, and shortening them back in later years when the spurs are established and the trees are making less growth. In older trees where spurs have multiplied too numerously they should be thinned out in order to prevent over-setting and consequent small fruit; exhausted spurs should also be removed, to encourage the growth of new spurs or laterals which will subsequently form fresh spurs.

Dormant Buds.

The wraps on buds, either in nursery stock or old trees, may be removed now.

Woolly Aphis.

This pest generally gets ahead of the orchardist during the busy part of the fruit season when it is almost impossible to attend to it. In these cases the trees should be sprayed as soon as the crop is gathered. This should be done with a high pressure spray, the nozzle being held very close to the affected parts of the tree. When spraying in this manner a large quantity of spray is used, and on big trees quite a pool of mixture will accumulate at the base of the tree by the time the spraying is completed. For this reason it is safer at this time of the year to use a tobacco wash rather than an oil spray, when dealing with this pest.

Codlin Moth.

Although the apple and pear crop may be harvested, the bandages should be kept on the trees. Many grubs will be found sheltering in the bandages, having been driven out of other hiding places by the cold weather and winter rains.

Fruit Fly.

All fallen fruit should be regularly picked up and destroyed by either burning or boiling. In citrus orchards situated in localities where fruit fly has been bad during the summer, kerosene traps should be hung on the sunny sides of the trees. Two-pound jam tins cut down to a depth of 2½ inches, and fitted with a wire handle, make a good trap, and do not spill as readily as a flat tin, such as the sardine tin.

Harvesting.

In the Tableland district there will still be late varieties of apples, such as Yates and Granny Smith, to harvest.

The winter crop of passion fruit will be coming in this month. The fruit should be regularly picked as it reaches a uniform black colour.

Drainage.

The past wet summer will have probably shown where wet patches are likely to occur in the orchard. These patches should be marked, and an effort made when work slackens after the fruit season is completed to provide underground drainage. Good underground drains may be made with broken stones or unglazed agricultural drain pipes.

THE RELATION OF FARM WEEDS TO HAY FEVER.

THAT plants have for long been considered as in some manner connected with the cause of hay fever is indicated by the name of the malady, but it was not till recent years that the exact relation of plant pollen to the disease was established. To-day it is well known that pollen produced by the flowers of certain plants is directly responsible for most cases of hay fever, but even yet there is not a little misconception about the kinds of plants that cause the disease. A note in *The Monthly Bulletin* of the California State Commission of Horticulture for February points out that the presumption that conspicuous and showy flowers are the cause is an error. The pollen produced by large or showy blossoms is almost always carried by insects, being relatively heavy, and not produced in great abundance. On the other hand, most plants with small, inconspicuous flowers, are wind-pollinated, and their pollen is therefore light, and produced in great abundance. "It is this voluminous, light-weight pollen, that reaches the nostrils of susceptible people and causes the trouble." The patient, noticing the showy flowers of trees or shrubs, is likely to hold them responsible for his hay fever, whereas the cause is much more likely to be the despised weeds of the wayside or the neglected corner.

By experiment, it has been proved that certain plants provoke the symptoms of the disease, and often botanical relationship furnishes a clue as to whether or not a suspected species is injurious. The results so far obtained have proved certain common weeds to be serious offenders, while others are under strong suspicion. It is of particular interest to us in New South Wales to learn that certain burr-bearing plants (*Xanthium* sp.) give positive evidence of producing the disorder, while Bathurst burr in particular is much suspected. Fat-hen (*Chenopodium album*) has given a mild reaction, and all the docks (*Rumex*) are suspected in California, and even a species of saltbush (*Atriplex*) set up the symptoms in the case of one patient. That sufferers from hay fever have a special and peculiar interest in the destruction of weeds appears to be already established, at least as to certain kinds.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	
Dungog A. and H. Association	W. H. Green	May 2, 3
Coonamble P. and A. Association	J. C. Wilson	,, 2, 3
Kyogle P., A. and H. Society	D. Campbell	,, 9, 10
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 10, 11, 12
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 21, 22, 23
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Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 13, 14
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Agricultural Gazette of New South Wales.

Sweet Corn or Table Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE cultivation of sweet corn as a green vegetable is gaining ground slowly in this State, and seed of many varieties can now be obtained from most local seedsmen. Up to the present its culture has been chiefly confined to small patches in a few market gardens and to a few stalks in home vegetable plots. This limit is determined mostly by the very small demand for it as a fruit or vegetable (fresh or cooked), due to the ignorance of the average Australian, that a specialised type of maize exists that is much superior in quality to ordinary field maize, which is known by nearly all to be edible in the "roasting" stage. Those who have had the pleasure of tasting sweet corn fresh on the cob or cooked as a vegetable, never hesitate to ask for it again; but it is sometimes a trouble to induce a person who does not know sweet corn to try it, for many, curiously enough, look upon it as "just corn," and, therefore, "food for horses or pigs." In the United States of America sweet corn is one of the most common vegetables (boiled or roasted) in the home, and it is said that it is practically impossible to find a home garden in the North-eastern States without a plot of it. It is probably safe to say that fully 90 per cent. of the people in this State have never tasted the true sweet corn on the cob; yet it can be grown as a vegetable in nearly every part of the State, except the dry west.

Sweet corn has been grown in the United States of America since early in the nineteenth century, and, according to the 1910 census, there were 178,224 acres under this crop during that year. In fact, the demand for sweet corn as a vegetable has become so strong, that special attention has been given to evolving early varieties which shall be first on the market and obtain the top prices, while the quality (sugar content) has also been greatly improved by selection.

With the demand slowly growing in this State, it is probable that not only will sweet corn occupy a greater area in our market gardens, but that its culture will also extend to field areas. Even before the local demand becomes sufficiently strong here it is possible that it will be profitable to grow it here in the summer and autumn for export to America during their winter and early spring.

Most of our canned sweet corn comes from the United States, and this is a side of the industry that might even be more important owing to the present high oversea freights and the chance of existing local fruit-canning factories to put a good brand of sweet corn on the market.

Sweet Corn a Distinct Type.

It may seem elementary to some to explain that sweet corn is a distinct type from field (dent or flint) maize, but it is certain that there are many who do not know it as such. The sweet corn seed is characterised by its translucent horny appearance, and its wrinkled or shrivelled condition. This is due to the fact that the endosperm is of a uniform horny consistency, and the kernel when drying wrinkles irregularly over the entire surface, owing to the contraction which occurs. The grain has a high sugar content in the milk stage, and this is converted slowly into starch on drying Dent maize also contains some sugar at the milk stage, but this is converted quickly into starch on maturing. White varieties of dent corn usually contain more sugar in the milk stage than yellow varieties, and they are often put on the market at this stage as sweet corn. The writer recently purchased several cobs of "sweet corn" from some of the retail shops in Sydney, and they all turned out to be Hickory King—a well-known white dent variety. This cannot be compared to the true sweet corn for quality; and it is probable that this practice of substituting field corn for sweet corn on the part of growers has prevented the demand from growing as fast as it might have done. Unfortunately, there is little difference to the unpractised eye between some of the white dent varieties and some of the sweet corns at this stage.

Good sweet corn seed should be highly translucent or semi-transparent when dry. If the seed is very opaque, either the variety or the seed is not good; and if the sample contains grains which are unwrinkled, it shows that there is an admixture of field maize of the flint or dent type, which is a serious objection. Sweet corn that has been cross-fertilised by flint or dent corn shows the type of the latter grain during the year that the corn is crossed. An ear that has been partially crossed by dent corn will therefore show distinct sweet corn and dent corn grains. According to Mendel's law of heredity, the sweet type and the dent type are a pair of unit characters of which the former is recessive and the latter dominant. As the recessive character breeds true, sweet corn grains can be picked out from any ear showing admixture, and they will come true to type in the resulting crop.

The colour of sweet corn seed may be white, yellow, red, or black, according to the variety, most varieties being white.

The sweet corn plant is similar to that of flint or dent corn, but it never grows as tall a stalk nor as long a cob. It is not quite as hardy in growth as field corn, and as the seed is also more difficult to cure without becoming mouldy, on account of its high sugar content, the germination is not always as good as that of field corn.

Site and Soil.

As with field corn, sweet corn is a warm weather crop, and the site chosen in a market garden should be one which gets a large share of sunlight, such as a northern or eastern slope. At any rate, a southern or western slope is to be avoided if possible. When we in this country arrive at the stage in the growth of sweet corn at which early varieties are required, in order to get the higher prices with the earliest market, it is probable that the nature of the soil will be a factor to be considered—a sandy loam being more desirable than a heavy loam, as the former means earlier maturity. A loam or clay loam soil is, therefore, just as desirable for sweet corn as a sandy loam; but in all cases the soil must be deep and rich, well supplied with organic matter, and also well drained. If the soil is deficient in organic matter, this must be supplied in the form of stable manure, or green crops ploughed under. The green crops most suitable for this purpose are legumes, such as cowpeas, velvet beans, field peas, or vetches.

Manuring.

Most market gardeners depend on stable manure as a source of organic matter, and on most farms and private gardens it can be obtained cheaply enough to warrant its use. On poorer soils as much as 20 tons per acre will be found desirable, while on better soils from 8 to 10 tons will be satisfactory. A summer-growing crop like sweet corn enables stable manure to be applied at the best possible time, viz., the winter, and in the best possible way, viz., carting out the fresh manure and spreading right over the ground, to be thoroughly worked in later. If, owing to the presence of a winter crop on the land, the application of the manure is delayed until near the planting time of the sweet corn, well-rotted manure should be used.

Fertilisers.

Stable manure is deficient in phosphorus, and superphosphate should be applied in the drills at planting time, at the rate of 1 or 2 cwt. per acre. On soils that are not too well supplied with organic matter, and which are therefore deficient in nitrogen, a top dressing of ½ to ¾ cwt. per acre of nitrate of soda between the drills, about a month or six weeks after planting, is recommended, especially if the crop has not a dark green healthy appearance at this time. Sweet corn is not as hardy as field corn, the young plants making a slow growth, especially if sown early in spring. The application of superphosphate with the seed has the effect of quickly developing the young seedling and encouraging a vigorous root growth.

Preparation of the Soil.

This is a question of the greatest importance in growing corn. No amount of after cultivation can make up for insufficient preparation of the soil for this crop. A deep and thorough ploughing should be given during the winter, and the land should be allowed to lie in the rough state until spring, when it should be reploughed and harrowed or disced down into a good seed-bed. If a green crop is to be ploughed under in spring, it is a good plan to roll it down and disc-harrow it, to chop it up and mix it with the surface soil before ploughing under. By this means the organic matter is more thoroughly mixed with the soil instead of being turned under in a mass. Any organic matter should be ploughed under at least five or six weeks before planting is to take place. Where a good ploughing has been given in the autumn or winter, a shallow or skim ploughing will suffice in spring. After spring ploughing the ground should be harrowed down immediately to prevent evaporation, which is becoming more active at this time of the year.

Planting.

Sweet corn plots are necessarily somewhat small in size compared with those of field corn, and in most cases the sowing will be done by hand. A shallow furrow may be opened out with a mould-board plough and the seed dropped in it. Covering may be done also with the plough if the soil is in good condition, and the whole then harrowed over. If a sowing is made in early spring the seed should not be covered very deeply as the ground has not become sufficiently warm to any depth. This is of especial importance in the case of sweet corn, as the seed rots in cold ground more easily than dent corn. This factor should also be borne in mind in determining the time of sowing. It is best to allow a fortnight or so later than the safe date for planting other corn, not only on account of the danger of poor germination, but also because the young sweet corn plant is more susceptible to injury by cold weather, and if cut by frost will not come again with the vigour that has been often surprisingly observed in the case of dent or flint corn. Where the planting season extends over several months, as is the case on the coast, a regular succession of crops can be maintained by planting at intervals of two to three weeks from September till January or February. Where artificial watering is impracticable, the early and late plantings are likely to do best on the coast, and the late plantings escape most from the ravages of the earworm where this insect is troublesome.

In America where the first sweet corn on the market brings the highest price, and also in some very cold districts where the season is too short for other corn to mature, recourse is had to the method of starting in pots in a hot bed or cold frame, and then transplanting after the plant has attained a height of 5 or 6 inches, or when all danger from frost is past.

As sweet corn never grows very tall it can be planted more closely than field corn. On rich market garden soils planting in hills 3 feet apart each way is recommended, while on ordinary fields the distance may be increased to 3½ feet by 3½ feet, or 4 feet by 3 feet. The sowing of several seeds in a hill is preferable to that of single grains. Owing to the germination of sweet corn seed sometimes being unsatisfactory, it is best to sow from six to eight seeds in a hill, and finally to thin out the plants to two or three. Advantage can be taken in this thinning to remove the weakest seedlings in the hills, only leaving the most vigorous. This is a practice to be thoroughly recommended in the case of sweet corn, for owing to the fact that little or no attention has so far been given to the selection and breeding of this crop, there are many weak plants which can be profitably removed at this stage.

Cultivation.

The cultivation of sweet corn does not differ greatly from that of any other corn, except that it requires a little more attention owing to its being less hardy.

The time to start cultivation begins from the time the seed is planted. A thorough harrowing with a light implement before the plants show through is most valuable if rain comes soon after planting. This harrowing can be repeated, but across the field, after the plants are through the ground and until they are 4 or 5 inches high. It is sometimes thought that such harrowing of the growing crop tears out or breaks too many plants, but it does not do as much damage as one would think if the operation is properly carried out. Young plants will be found to be very brittle in the early morning or on a dull day, but if the harrowing is left until the latter part of the forenoon of a bright day the number of plants broken by the harrows will be negligible. Of course, the harrow must be kept free from rubbish, for it is this clogging of the harrow which is the cause of most damage. Those who have tried harrowing the young crop have seldom been disappointed with the result, the main object being the destruction of young weeds which are just commencing, and especially those which are starting in the rows, which would never be reached by a later cultivation up and down the rows.

Later cultivations are done with a single or a double horse cultivator which straddles the rows. In the case of a single-horse cultivator, it is to be remembered that a fine-tined implement can be worked closer to the rows, and is the ideal implement for making a soil mulch to check evaporation or for dealing with young weeds, but the five or seven-tined cultivator with broad shovels will more effectively tear out older weeds or deal with harder ground. In the case of sweet corn, however, it will never be found advantageous to allow weeds to get past the stage when they cannot be destroyed with the fine-tined cultivator.

It is impossible to cultivate sweet corn too often, and most of the work should be done during the young growth of the plants. It may be cultivated almost right up to the harvesting stage, though if it has been well cared for up to the tasselling stage this will usually be found sufficient. The best time to cultivate is as soon as practicable after rain, but the purpose of cultivation is not only to conserve moisture and kill weeds but to aerate or warm the soil; hence a valuable cultivation can also be given without waiting for rain.

Shallow cultivation should be the general rule with sweet corn, except for an early sown crop or in a cold district where the first few cultivations may be deep (say 4 or 5 inches), so as to aerate and warm the soil to a greater depth.

Suckering.

The removal of the suckers which form abundantly on most varieties of sweet corn is generally conceded to cause the production of a greater number of marketable ears on the main stalk, and owing to the small size of the fields of sweet corn usually sown, it is considered that this practice is a profitable one with this crop, especially also if the suckers are carried out and fed to stock.

Harvesting.

There is usually some difficulty for the beginner in determining the correct stage at which the ear should be harvested, but after a little practice this becomes quite easy. It is best for anyone who is unfamiliar with the crop to note the different stages of colour of the silk of the ear, and test the corresponding stage of maturity of the corn by stripping back the husks of a few ears until it is possible, to tell the right stage of maturity by the appearance of the silk. The corn is at the best stage for harvesting when it is slightly past the full milk stage, but before it turns to soft dough. At this stage the silk of the ear is just turning from brown to black, and the milk does not leave too easily when the thumbnail is pressed into the top of the kernel. Some growers also go by the plumpness of the ear under the grasp, and this is a good method after some experience has been obtained with it, especially if taken in conjunction with the colour of the silk.

Harvesting is done by breaking the ear from the stalk at the upper end of the shank, so that none or very little of the latter is attached to the ear, which, however, has the complete husk around it.

The cobs are picked into canvas bags slung round the shoulders or into baskets, whence they are put into boxes or bags at the ends of the rows, or distributed throughout the field.

As sweet corn rapidly loses its flavour after picking, especially in hot weather, it is best to do most of the harvesting late in the afternoon and get the corn on to the market the same night or the following morning, or if it is to be used for canning, the corn is best picked in the early morning and canned the same day.

Utilising the Stalks.

When the ears of marketable size have been harvested there are a number still left which are too small to pull, and these, in addition to the green stalks, may be converted into silage or used for green fodder. The stalks are so thin and succulent that they scarcely need cutting up for feeding to cattle, which if turned on to the fields with the standing stalks will clean them up almost entirely.

Marketing.

It is advisable to make some attempt at grading the product for market. Ears of uniform size, with the same maturity of husk, and of the same variety of corn are best selected for a single grade. The appearance of the ears may also be improved by removing one or two of the outer leaves or bracts of the husk.

Sweet corn is mostly marketed in bushel or half-bushel boxes or crates. The half-bushel crate contains a little over two dozen ears of medium to large size. Some growers pack their corn in bags, but this method is most unsatisfactory as the corn is more easily damaged, and mould then forms very quickly.

Owing to the desirability of getting the sweet corn to the consumer as soon as possible after it is pulled, more satisfaction will be given if the product can be sent direct from the grower. This method of marketing can be put into practice at least in the case of the big hotels, and of retail greengrocers who have sufficient demand for the product, and who wish to gain further favour by supplying sweet corn of superior quality.

Yields and Returns.

The yield of sweet corn, of course, depends on several factors, not the least of which is the variety. As a rule, late varieties give better yields than early varieties, and also a greater percentage of marketable ears.

A fair yield on ordinary corn land is from 300 to 500 dozen marketable ears per acre, but larger yields have been obtained in this State on second-class corn land in a good season, and should easily be obtained on rich market garden soils.

The market price is usually about 3s. per half-bushel case or crate, which usually contains just over two dozen cobs, or the cobs are sold loose at about 1s. 6d. per dozen. The retail price in the Sydney shops is 2d. and 3d. per cob. There is not, however, as mentioned before, much demand for it. This may be partly due to the high price asked, but the ignorance of the true character of sweet corn and the poor quality of field corn sold as such, are also responsible.

For canning purposes, £10 per ton of unhusked ears is a fair price for a canning factory to pay. From 2 to 3 tons of cobs per acre is a reasonable yield under ordinary circumstances.

In reckoning the profit per acre, the value of the remaining stalks must also be considered. This will vary from £1 to £2 per acre, according to yield and to the use the grower can make of them.

Harvesting and Curing Seed.

More difficulty will be experienced in saving sweet corn seed than that of other corn, owing to the comparative ease with which it develops mould while drying, due to the high sugar content.

Yet the practice of growing one's own seed of sweet corn is to be thoroughly recommended, because of the vast improvement it is possible to effect with this crop by seed selection. Very little attention has been given to sweet corn here in this direction, fresh seed being mostly obtained from America; but there is no reason why, with a little care in saving seed, we should not be developing varieties and strains by breeding and selection which are more suited to our climatic and market conditions.

It is best to allow sweet corn to thoroughly ripen on the stalk, and then husk and harvest in the field on a warm dry day. The husked ears should be left in small piles in the sun for an hour or two, and brought into the seed house or barn the same day. They should be hung in a well-ventilated spot until they are thoroughly dry. These simple directions are easily followed: but if the sun-drying is omitted, or if humid, dull weather is chosen for harvesting, much trouble will be experienced in getting seed of good germinating capacity.

Insect Pests.

The worst insect pest of sweet corn is the earworm. Field maize and other crops are attacked by this insect, but it has a decided partiality for sweet corn. It is most prevalent on the coast, but is also found on the tablelands. It is apparently worse in some seasons than in others; and although the writer has seen plots of sweet corn on the coast which were not much troubled with this pest, it is feared that it is only a question of time before it will make its presence felt.

The adult moth lays its eggs on the silks of the ears, and the young worms burrow their way down to the grain, which they gnaw round and destroy, leaving the path behind them filled with refuse and excreta. When full grown they bore their way out through the husk, and fall to the ground and pupate. Rain enters the ear through the hole in the husk, and in a wet season much damage is caused by the development of mould.

It is rather difficult to deal with such a pest, but the best results in other parts of the world have been obtained with a sprinkling of dry Paris green on the silks, or by the application of a thin paste of starch and Paris green—both rather laborious methods of control.

Varieties.

There is an ever-increasing number of varieties of sweet corn, and it is obviously impossible to describe them all at this juncture. In fact, there are some varieties which are grown in America, or listed in American seed catalogues, which have never yet been grown here. It is hoped it will be possible to express an opinion concerning most of these at some future date, but, for the present, attention will be given mainly to those varieties which are obtainable from local seedsmen.

As a general rule, it may be stated that the earliest varieties grown in America are not the most suitable for growing for market here, owing partly to their small size, but also to the fact that there is not sufficient demand for sweet corn here at the beginning of the season to bring the much higher price necessitated by the sacrifice of yield. The later varieties will therefore be most popular here for some time, on account of the larger size of the cobs and the better yield. Usually, also, the later varieties are more suitable for canning purposes, while the early varieties are popular for home garden plots. The latter do not usually do as well under field conditions as they are not as hardy.

Golden Bantam.—A very early variety which grows small stalks and cobs. It is a yellow-grained variety of very sweet flavour, and is more suitable for the home garden.

Peep of Day.—Another very early dwarf-growing variety with white grain, but otherwise similar to Golden Bantam. The cobs are very small and the quality very good. It is slightly more prolific than Golden Bantam, but is only recommended for the home plot.

Early Fordhook.—Another very early variety of short growth, but slightly larger ears than the previous two. The grain is white, but on account of its poor flavour it is not worth consideration.

White Cory.—A very sweet, early variety which has a good reputation in America, but which does not seem to do so well under our conditions.

Crosby's Early.—There are apparently several different strains of this variety. The type obtained from local seedsmen is a white, very early strain, and, in fact, it was the only variety from which cobs were obtained before Christmas when planted near the end of September at Cooranbong last season. It gave by far the largest yield of any of the early varieties, but is not equal to the best of them in flavour. It also did best in a trial of early varieties at Mittagong. The period of harvesting lasted about three weeks at Cooranbong, and the variety may be recommended for planting on large plots under field conditions, for market or for canning.

Early Darling.—An early variety obtained from Melbourne seedsmen. It is a white variety of excellent flavour, and is more suited to colder climates.

Cosmopolitan.—A white, early variety of excellent quality, rather prolific, and giving a good picking of cobs for over a fortnight. It seems to be better suited to good rich soil.

Early Mammoth.—A white, early variety with fairly large ears, but not a good yielder and of comparatively poor flavour.

White Evergreen.—A good yielding, late, white variety, with large stalks and large cobs. In a test of varieties at Cooranbong last season it easily surpassed all others for yield, and size of cobs, which averaged nearly 1 lb. each in weight. It can be recommended as a sweet corn for market, but it is not quite as sweet as most others. It can also be confidently recommended for growing for canning purposes. It is slightly earlier than Stowell's Evergreen.

Country Gentleman.—A white corn with narrow, deep grains, somewhat irregularly placed on the cob. It is late maturing, with large cobs, sweet and tender. It is suitable for market, and for canning.

Stowell's Evergreen.—A white variety of good flavour, later maturing than White Evergreen. It is recommended for market and for canning, and is said to retain its quality longer than most varieties after harvesting.

Canning.

It is only recently that attention has been directed to the fact that we have been importing canned sweet corn for a number of years, and the high shipping freights have caused inquiries as to whether it could not be more profitably grown and canned locally.

A few simple directions for the canning of sweet corn may be useful to owners of factories who wish to take up the canning of this product, and the information may also be adapted for home use.

In the first place, it is only possible to turn out a high grade of canned sweet corn by using cobs of a good variety and of uniform maturity. Any variety of corn other than sweet corn is wholly unsuitable for canning. The best stage of maturity for canning is when the milk is thick and does not leave the kernel easily on pressure. Older and younger corn requires slightly different treatment, and if corn of a mixed maturity arrives at the factory to be treated, it should first be graded as to its condition in this respect.

In the American canning factories the husk is removed by machinery, and the silk by revolving brushes. Cutters and scrapers then remove the grain from the cob, and the corn again passes through a machine to remove bits of silk, husk, and cob, in order to have a clean final product.

The corn is next thoroughly mixed with syrup made in the following proportion :—30 gallons water, 15 lb. granulated sugar, and 3½ lb. dairy salt. A preliminary cooking is then given to set the milk and blend the syrup with the corn.

The temperature used in this cooking should be at least 170 degrees Fahr., for it is at this temperature that the corn should go into the cans. If they are filled at a higher temperature the cans will be slack when cold, and if at a lower temperature the time of processing will be increased. When the work is once started, it is necessary that it should be continuous. Pack the corn fairly tightly into the cans and add more syrup if necessary. Solder on the caps, place the cans in the boiler, bring to the boiling point very slowly, and cook for twenty minutes under a pressure of 10 lb. Remove the cans from the boiler and pick a small hole in the top of the can to allow the steam to escape. Then seal the cans with a tipping iron, place in the boiler, and cook for fifty minutes with 12 lb. pressure. If it is desired to can older and harder corn, the second cooking should be extended to sixty minutes under 15 lb. pressure. At the end of the day's work, clean all machines thoroughly, using hot water in which bicarbonate of soda has been dissolved.

There is a great deal of difference in the quality of the product turned out by different canning factories. The most important point is to get the corn uniform and at the right stage of maturity. If the corn is too hard and takes longer processing or a higher temperature, the colour becomes browner and the cooked taste more pronounced.

Conclusion.

There are many districts in this State which are too early to mature other corn, but where, on account of the short growing season required for sweet corn when it is harvested green, this crop can be successfully grown. The Southern Tableland offers many localities where the soil is good and where field maize cannot be matured. Such districts not only usually produce a better quality of sweet corn, but are almost completely free from the chief pest of sweet corn previously noted, viz., the maize earworm.

Sweet corn should also grow well on the best soils of the Murrumbidgee Irrigation Area, and the local canning factory might be induced to extend its operations to deal with this product. A January sowing on the Area would give the best results, maturing before frost, and coming in at a time when the rush of fruit canning is over.

For the marketing of the fresh product in cities and large towns, the market gardener has a distinct advantage, owing to the somewhat rapid deterioration in quality after harvesting.

It would be easy to overwhelm the demand by the supply at present, but the demand is growing, surely though slowly, and a food product of the quality and value of sweet corn should not be long in finding its way into the everyday diet of the people.

Ayrshires at Glen Innes Experiment Farm.

R. H. GENNYS, Manager.

THE Ayrshire is one of the hardiest of all breeds of dairy cattle, their active, comparatively light frames enabling them to move quickly and search for food without much trouble. For some classes of country, as all-round dairy cattle, they are unequalled, for they are prolific yielders of milk which will produce either butter or cheese of excellent quality; and as beef cattle their steers are far before some other dairy breeds. For crossing purposes they are most useful when mated with the Shorthorns, the combination generally producing a dairy cow of the first class.

For such a cold climate as New England they are well adapted, and their hardiness is well proved. When on comparatively poor pastures, they have done better than the Kerry cattle which they followed. The last-named were never contented at this farm, but the Ayrshires quickly adapted themselves to their changed conditions and settled down at once. However, since their arrival a few years ago, the quality of the grass and herbage has been much improved. The silo has also been introduced; it is filled every year with maize, grass, or clover, but chiefly with maize alone, and has kept the milk flow nice and even for the greater part of the year. The good butter-fat tests will show the quality of the strains we are using in that connection. Strong constitutions with good dairy qualities are aimed at, as well as correct Ayrshire outlines. Some critics may say that some of the young stock are too robust in appearance, but they will tone down at the milk pail as others have done. Some Ayrshire studs of a few years ago were inclined to run too fine and delicate, with very short and almost useless teats. This latter point it has been the effort to improve here, although it may be somewhat at the expense of the pretty, symmetrical Ayrshire udder. Should not any good point in any animal indicate some useful quality for the purpose for which it is intended? Do these pretty, almost teatless udders do this? If not, why require them as show points? The comfort of milkers and the possibility of quick, free milking is surely of more importance!

The Ayrshires were started at this farm in a very modest way, with a few cows and that useful little bull, Orphan Boy, whose stock are doing him credit. The young stock here now generally possess the qualities of a really good stud herd, and new blood of first-class strains is to be introduced to yearly improve them. Any cows over 5 years old were purchased as heifers from the well-known studs of the late Sir John Hay, of Coolangatta, or Mr. A. W. Everett, of Ollera, or were transferred from the Department of Agriculture's herds on other farms. The sires that have been used so far are Orphan Boy, by Songster of Greystanes, from the well-known stud of Mr. A. W. Woods, of Glen Elgin, Inverell, a well-known prize winner. Later followed the imported bull Wyllieland Bright Lad, from Scotland, a beast of great weight and constitution. His stock certainly follow him in robustness, and the only one of his heifers yet milked has performed well. The bull now being used is Auchenblae of Grafton, 21 months old. He is red and white in colour, and is a well-grown animal, nicely proportioned throughout, with every appearance of doing justice to his fine breeding. He should mate well with the heifers that have been bred here. He was bred by the Department of Agriculture at Grafton Experiment Farm, and is by that fine bull Isabell's Majestic, ex Rose Auchen, by Daniel of Auchenbrain (imported) from Primrose II. Isabell's Majestic, his sire, is by Majestic of Oakbank, ex Isabel of Gleniera, by Red Chief from Gaiety. Majestic of Oakbank is by Jamie of Oakbank, ex Maggie Lauder of Oakbank.

Lady Dado of Glen Innes is, so far, one of our best butter-producers, and any dairyman might be proud to possess her. She has had four calves—all heifers. The one named Picture, which had a season here, gave a very good account of herself; and the good opinion of her then formed, is confirmed by reports from Yanco. Ornament, who was transferred younger, is also reported to be doing well at Yanco. Lady Dado's other two heifers, which both look very promising, remain here. In appearance she is a white-and-brown cow, and, although of true Ayrshire type, she has a rather short neck and compact frame, though her great depth, finely-arched flank, and large udder with splendid teats, proclaim her a dairy cow in every respect. Lady Dado came here as a heifer from Hawkesbury Agricultural College, and she is now nearly 7 years old. Her breeding is: sire, Dado of Grafton; dam, Hawkesbury Gladys, by Emerald's Mischief from Hawkesbury Lily, by King (imported from New Zealand) from Lily (imported from New Zealand). Her records to date are as follows:—

Group of Ayrshire Cows at Glen Innes Experiment Farm.

First year, 4,767 lb. milk with 4·06 per cent. test, yielding 223·92 lb. commercial butter.

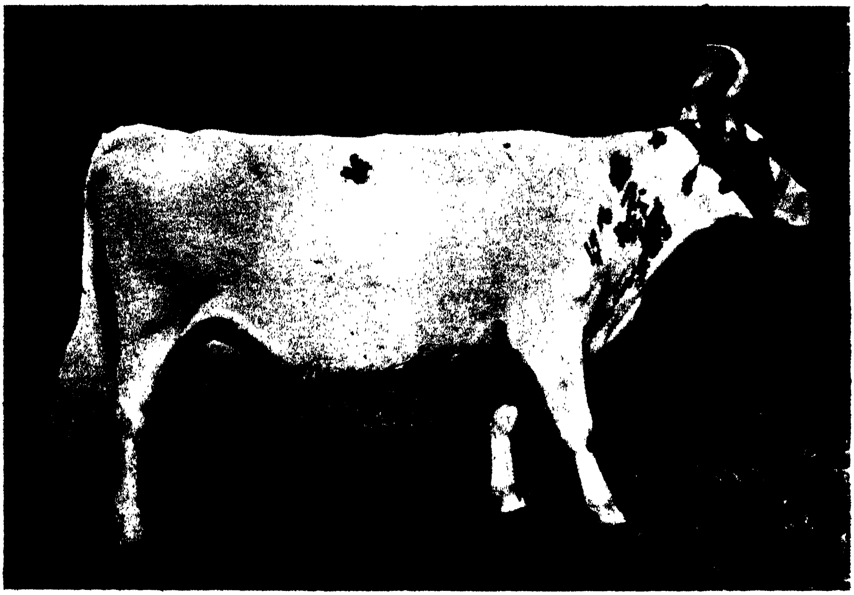
Second year, 8,273 lb. milk with 4·6 per cent. test, yielding 448·47 lb. commercial butter.

Third year, 10,008 lb. milk with 4·1 per cent. test, yielding 471·36 lb. commercial butter.

In the first six months of her fourth year (and she is still going strongly) she has given 6,253 lb. of milk, with 4·17 per cent. test, yielding 295·32 lb.

of commercial butter. Thus, for three and a half years' milking, since she first calved, she has given 29,301 lb. of milk, with an average test of 4·23 per cent., and 1,439·07 lb. butter; that is, her yearly average is 411 lb., or about 1⅛ lb. of commercial butter for every day of the whole period.

Clarice of Glen Innes, now 6 years old, is perhaps the pick of the basket, and she is aptly the daughter of All-U-Want (her sire)—for she is not only a first-class dairy cow, but the type of Ayrshire to be aimed at; handsome, large, fine udder, good teats, and showing great dairy possibilities. She is white in colour, with brown spots well placed, a beautiful soft and flexible skin, large frame on short strong legs in conformity with her body weight, a fairly large, kind head, with neck, shoulders, and chest to match—all a trifle strong, showing her great constitution. Her middle piece is both deep and broad, showing well-sprung ribs, very broad across the hips, with hindquarters and escutcheon showing all the capacities of a breeder and milker. Her pedigree speaks for itself. She was bred at the late Sir John Hay's Coolangatta estate, and came here as a heifer. She is by All-U-Want (imported), ex Coral of Coolangatta, by Jamie of Oakbank from Clarice of Oakbank. Her sire, All-U-Want, was selected in Scotland by Mr. J. A. Robertson, now Herdmaster of the Department, and he is by Lessnessock Douglas Monarch, ex Netherhall Susy, by General McDonald of Hillhouse. Clarice of Glen Innes gave 7,673 lb. of milk, 3·5 per cent. test, yielding 314·27 lb. butter, in forty-eight weeks on her first calf; also 6,948 lb. milk, 4·35 per cent. test, yielding 341 lb. butter, in 273 days.



Clarice of Glen Innes.

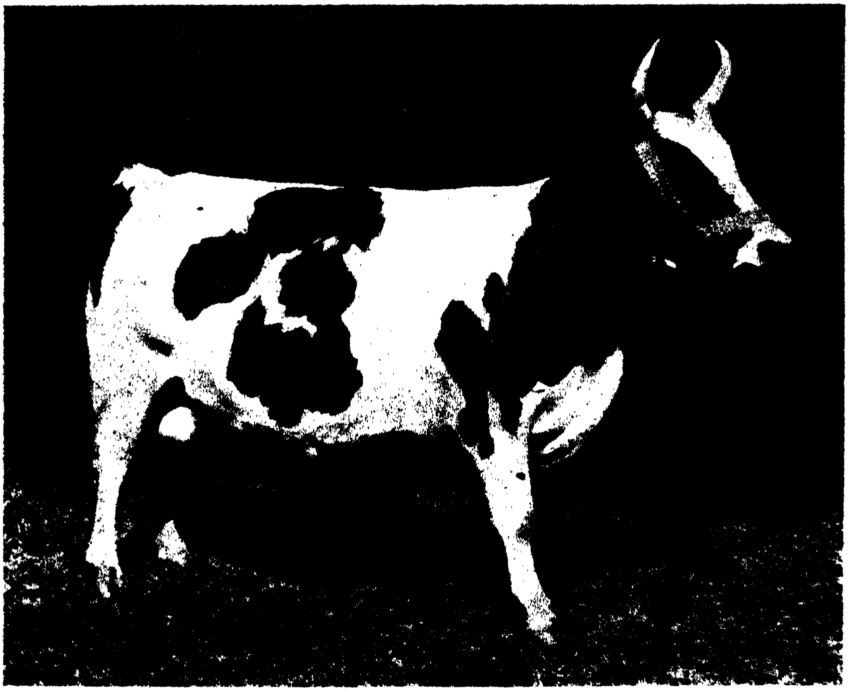
Gave 7,673 lb. milk, 3·5 per cent. test, and yielding 314·27 lb. butter in 48 weeks on her first calf.

Primrose II (illustrated on this page) is by The General, ex Miss Prim, by Mischiefmaker (imported) from Primrose of Barcheskie (imported). She has yielded in one milking period 6,948 lb. of milk, 4·2 per cent. test, and 343 lb. butter. She is now 15 years old, and is still breeding. In appearance she is a fine big type of Ayrshire, with grand carriage, typical of good breeding. She is white in colour, with brown spots, of great length, and, indeed, largely proportioned in all directions. Her udder is capacious, with big teats. Her style and constitution point her out as a breeder of bulls of no mean appearance, and her calf, Duke of York, now 6 months old, appears to possess all the strong qualities of his aristocratic-looking dam. It is stated that Primrose's grand dam gave 6 gallons of milk per day in Scotland.

Primrose II.
Gave 6,948 lb. milk, testing 4·2 per cent., and yielding 343 lb. butter in one milking period.

Black Cap III, bred by Mr. A. W. Everett, Ollera, is by Punch, ex Black Cap II, by Zulu of Glen Elgin from Black Cap of Oakbank. She is brown and white in colour, beautifully marked, and quite a picture cow for the Ayrshire type, for she has the wedge-shape well defined, and her pretty head and horns, and light clean forequarters, with great depth of barrel, can scarcely be found fault with. Her hindquarters are good, but slightly spoilt by her tail commencing not quite correctly. She has a nice udder, with fair teats only. This cow always commands much attention in the show-ring. Black Cap III has yielded 7,155 lb. milk, with 4·3 per cent. test, and 362 lb. butter, in 259 days. She has two nice heifers milking, which show, both in appearance and results, the value of their dam as a breeder. She has also produced a nice young bull in Black Chief, purchased by the Ben Lomond Estate.

Hawkesbury Duchess, white, with brown spots, has yielded in seven months —and still milking well—6,603 lb. of milk and 286·36 lb. of butter for that period. She is by Dado of Grafton, from Countess, by King (imported from New Zealand).



Black Cap III.

Gave 7,155 lb. milk, testing 4·3 per cent., and yielding 362 lb. butter in 259 days.

Barberry of Glen Innes is by Byron, ex Leaflet. She is a white and red cow of fair appearance; yielded 5,118 lb. milk, 4·2 per cent. test, and 250·84 lb. butter, in 273 days as a 2-year-old on her first calf. As a 4-year-old she gave 7,248 lb. milk, 4·24 per cent. test, and 344·71 lb. butter, in 273 days. The only record of her dam available is that she yielded in one week on her first calf 216 lb. of milk, 4·2 per cent. test, or equal to 10½ lb. butter per week. Leaf Bud, her grand dam, yielded 8,389 lb. milk, 3·4 per cent. test, and 333 lb. butter, in 273 days; and Roseberry, great grand dam, 5,799 lb. milk, 4·1 per cent. test, and 280 lb. of butter on her first calf.

Violet of Fordwick, 7 years old, brown and white, is a pretty dark-muzzled little dairy cow, with nice brown teats and well-balanced udder. She is very neat and well-proportioned throughout, and has very dark points for an Ayrshire. Though not a heavy milker, her milk is very rich. Her pedigree is fashionable, for she is by Nethercraig Brown Banker (imported), ex Burnhouse's White Rose IV (imported), by Captain of Burnhouses from White Rose II of Burnhouses. She has yielded 5,678 lb. milk, 4·3 per cent. test, and 287·10 lb. of butter in 262 days.

Jess of Coolangatta, although she has been parted with, may be mentioned on account of her fine heifer Jessamine, whose description is given below. Jess of Coolangatta is by All-U-Want (imported), ex Jeanfield Langlands III (imported). She yielded 5,864 lb. milk, 4·2 per cent. test, and 289·59 lb. butter, in 266 days when a 3-year-old. Her grand dam's milk record is 7,007 lb. milk, 4 per cent. test, and 328·86 lb. butter in twenty-six weeks.

Blackberry.

On her first calf gave 5,668 lb. milk and 285·18 lb. butter in 273 days.

Coming to the young cows on their first calves, Jessamine, from Jess of Coolangatta, by Orphan Boy, although she aborted at seven months, came straight into milk, and, like her mother, is a high tester. As a 2-year-old on her first calf she has yielded 5,082 lb. of milk and 282·54 lb. butter in 273 days, and she is still milking. She is a red and white spotted cow, with nice brown teats, and with milking points well developed.

Blackberry, who is shown in the accompanying illustration at 3 years old, has yielded on her first calf 5,668 lb. milk and 285·18 lb. butter in 273 days, and is still milking strongly. She is a sweet little brown and white dairy cow, of good Ayrshire type, with splendidly balanced udder and good brown teats, a most consistent milker and tester, and so far almost as good as one could wish. She is by Mr. Everett's fine bull Emperor, ex Black Cap III, before mentioned. Emperor, her sire, is by Principal of Oakbank ex Moth, by Bravo from Butterfly.

Pleasure, another of Black Cap III's progeny, at 2 years old has yielded, in eight months, 4,831 lb. milk, giving 237·12 lb. butter, and is still milking. In appearance she is a well-grown heifer, brown and white, with good dairy points, and although not so stylish as either her mother or her half-sister Blackberry, she is of the true Ayrshire type, and full of promise.

Bright Lassie, by Wyllieland Bright Lad (imported), ex Violet of Fordwich, was under 2 years when she calved, and gave 3,780 lb. of milk and 195·36 lb. of butter in 183 days, when she was transferred to Yanco, where it is reported she is going strongly.

Group of Ayrshire Heifers at Glen Innes Experiment Farm.

Lady Bird II, on her first calf, has not long started her career. She is a fine big brown and white heifer, of a hardy type of Ayrshire. She has only been milking for three months, and has given in that period 2,461 lb. milk and 79·5 lb. of butter. She is by Orphan Boy from Olive, who is by Punch from Olive of Coolangatta, by Prince Emerald (imported) from Lady Bird.

It might be noted that the above cows, both young and aged, are nearly all well above the United Purebred Cattle Breeders' Association's standard, and that the heifers promise to quite keep up the reputation of their dams. The standard alluded to is:—

2 years old and under 3 years ...	200 lb. butter in	273 days.
3 „ „ 4 „ ...	250 „ „	273 „
4 „ and over	300 „ „	273 „

Several heifers that have not yet calved, but that should soon come in, may be mentioned.

Coral II, a very handsome heifer, is by Orphan Boy from Clarice of Glen Innes. She is white and brown, with the typical Ayrshire head and body; her breeding should ensure her a good career.

Maud II, a nice-looking twin daughter of Olive, by Orphan Boy, will calve shortly. She is of the hardy sort, brown and white. Her sister, Eva II, came into milk rather early; she was transferred to Yanco a short time ago.

Lady Prim, from Primrose II, by Wyllieland Bright Lad (imported), is also a finely-grown red and white heifer. She should develop into a fine big cow, though she may not be as handsome as her dam, to whom she does not bear much resemblance.

Miss Dot, light red and white, is a well-grown, robust heifer, and possesses all the qualities of a good milker. She is from that fine yielder Lady Dado of Glen Innes, by Wyllieland Bright Lad (imported).

Moss Rose, the last of the two-year-olds not calved, is a red heifer with a little white. She is from Violet of Fordwich by Wyllieland Bright Lad (imported), and is another of the robust type sired by this bull.

There is also a string of youngsters from the cows before mentioned, from young calves to animals of over twelve months, by Wyllieland Bright Lad and Auchenblae of Grafton.

PURE SEED MAIZE.

THE Department of Agriculture has a limited amount of pure *selected* seed maize for sale for the coming season, both for grain and fodder purposes, as follows:—

Variety.	Seed available at	Railway Station or Wharf.
Improved Yellow Dent Leaming	Grafton Experiment Farm	Grafton.
Red Hogan	Hawkesbury Agricultural College	Richmond.
Boone County White	Berry Experiment Farm	Berry.
Early Yellow Dent	Glen Innes Farm	Glen Innes.
Silvermine	Yanco Experiment Farm	Yanco.
Hickory King	Emu Plains Irrigation Farm	Emu Plains.
Funk's Yellow Dent	North Bangaroo Stud Farm	Canowindra.
Reid's Yellow Dent Gold Standard Leaming	Department of Agriculture	Sydney.

The price is 7s. 6d. per bushel f.o.r. or f.o.b. at the station or wharf mentioned.

As the supply is limited, intending purchasers are recommended to apply early direct to the respective Experiment Farms or to the Department of Agriculture, Sydney.

All orders should be accompanied by remittance, with exchange added for cheques.

Improvement in Quality of Cream throughout the Byron Bay-Tweed River District.

A. M. BROWN, Dairy Instructor, and Inspector under the Dairy Industry Act.

Now that the Dairy Industry Act has been in operation for some time, it may be of interest to consider what effect this new legislation has had on the quality of the cream throughout the Byron Bay-Tweed River District, which extends from Binna Burra to Tweed Heads, and in which climatic conditions are mostly adverse to the production of a choice cream.

It can be stated without fear of contradiction that the quality of the cream from one end of the district to the other has improved wonderfully this season in comparison with what it was when I first came to the district in January, 1916, which was some months before the regulations under the Act came into force.

Causes of Improvement.

A number of factors have combined to bring about this great improvement. The first, and one of the most important, is that, with but few exceptions, there has been a universal daily delivery of cream to the factories. Even in out-back districts, like Tyalgum and Uki, where some of the roads are anything but good, the carters and suppliers have combined to get the cream to the factories each day, instead of three or four times a week as was the case last season. This in itself should do away with second-class cream to a great extent, but there are other changes which have taken place. Quite a large number of coolers have been sold by factory managers to the suppliers with good results; and where once it was a rarity to come across these in a dairy, they are now fairly common.

The fat content of cream generally has risen, and is mostly well above the standard of 35 per cent. This is one of the reasons why I have seldom come across a badly fermented cream this year; this was far from being the case formerly. Curdy creams show a marked decrease. It might be mentioned here, that on one occasion I was compelled to write to a number of suppliers about their tests being below the standard, and advising them to take steps to prevent a recurrence of the trouble. On my next visit to the factory in question, I found that all these farmers were then supplying cream which was well above the standard for fat content.

Farmers who cart their own cream can now be seen with covers over their cream to protect it from the direct rays of the sun. All cream carters who ply for hire have raised covers to their carts, so that a draught of pure air can get through without the sun's rays falling directly on the cans.

All empty cans are drained, and those not returned to the suppliers daily are placed on specially built racks where plenty of pure air is allowed to circulate; but in passing I might remind farmers that although cans are taken care of at the factory in this way, it does not relieve them of their duty of washing the cans thoroughly before using them again.

Farmers whom I have visited or spoken to about their second-class cream have always been most anxious to fall in with any suggestions, and seem quite willing to abide by the regulations.

All these examples of progress point to the fact that farmers have begun to wake up to their responsibilities, and to realise that by complying with the regulations under the Act, which have made these changes necessary, they will be enabled to do their share towards producing butter which will be of choicest quality on the local market, and when exported will be able to compete more favourably with other butter, as well as with margarine, on the English market.

Although these notes do not deal with the butter aspect, I would like to state that there has been infinitely less second-grade butter manufactured in this district this season than last. One factory I have in mind, which does not pasteurise, and which is situated in the midst of some of the best country on the Northern Rivers, packed 5 per cent. of its output for January, 1916, and 6 per cent. for the following month, as second grade. During the corresponding months this season it has packed less than 1 per cent. This is only one instance of the improvement which has taken place; but at every factory in this district, without exception, evidence of similar, and in cases greater, improvement would be shown by reference to the books.

ON SOME PLANTS WHICH CAUSE INFLAMMATION OR IRRITATION OF THE SKIN.

(Last *Gazette* reference, March, 1916, p. 212.)

THE Workmen's Compensation Act of 1916, which will come into force on the 1st July, introduces a new feature in legislation, in that in Schedule 3 it takes cognisance of the poisoning of a workman by a timber. If any workman be poisoned during any process in the manufacture of articles from *Gonioma Kamassi* (African Boxwood) compensation under the Act will come into force.

The liability of an employer from illness induced in his workmen by other irritating plants is only a matter of time, and therefore people have a very direct interest in the study of the numerous plants which, during the last few years, I have brought under notice in the *Gazette* under this heading.

African Boxwood, the wood in question, is sometimes known as East London Boxwood or Cape Boxwood, because of the South African locality from which it is obtained, and it is a substitute for boxwood.

Logically, if a farmer puts his men on to eradicate weeds which are known to cause sickness, it is only a matter of time when additions to the Schedule of the Act to which I have drawn attention will be made.—J. H. MAIDEN.

Farmers' Experiment Plots.

EXPERIMENTS WITH OATS, 1916–17.

NORTHERN DISTRICT.

R. W. McDIARMID, Assistant Inspector.

HAY and grain trials were conducted in various portions of New England and the north-west during the past season. The experiments were conducted by seven farmers, viz. :—

(1) Hay Trials by—
Mr. L. M. Rixon, Uralla.
Mr. J. T. Elliot, Armidale.
Mr. J. F. Chick, Tenterfield.
Messrs. Mitchell and Ross, Ravensworth.

(2) Grain Trials by—
Mr. A. Sommerlad, Tenterfield.
Mr. J. F. Chick, Tenterfield.
Mr. J. J. Carroll, Narrabri.
Mr. A. E. Weakley, Currabubula.

The experiments for hay purposes included a liming trial at Uralla and variety trials elsewhere. At Tenterfield the plots were sown for fodder, but they proved so successful that the crops were reserved for seed.

The season was suitable for oats in each centre, excepting Ravensworth, where the rain came too late to be of much benefit to the crops. The hay and grain crops in New England were heavy throughout, and the quality would have been excellent had the weather conditions been more favourable for harvesting.

The Liming Experiment.

This was conducted on Mr. L. M. Rixon's farm at Uralla, it being a continuation of the experiment commenced in 1915. Lime and fertiliser was applied in 1915, but neither was added during the past season, the object being to ascertain the lasting effect of the lime. The land was ploughed in February and again in July, and was harrowed after each such working. Sowing was later than was intended, owing to unavoidable delay in getting seed and to the wet weather. Sunrise variety was used at 2 bushels per acre, and sown on 6th July. The germination and growth was slow, owing to the wet and cold seed-bed, and the stooling was very scanty. The crop was rather light, as the figures below indicate :—

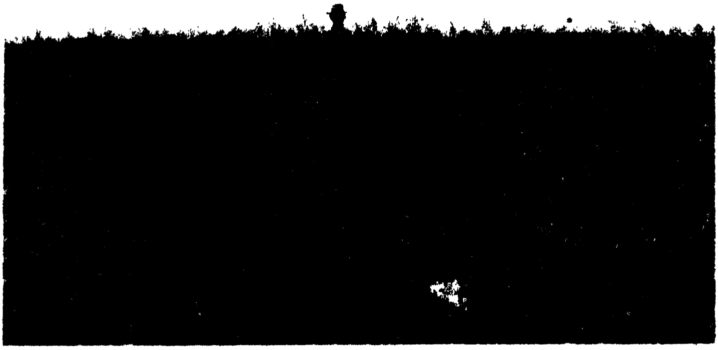
Plot.	Lime per acre.	1915.				1916.			
		t.	c.	q.	lb.	t.	c.	q.	lb.
1	Nil	1	8	1	25	0	19	1	0
2	½ ton	1	9	0	22	1	1	1	0
3	1 ,, ...	1	6	2	0	0	18	3	0

The results from each year are given, to enable comparisons to be made. The rainfall during the growing period in 1915 was 12·62 inches, and in 1916 22·66 inches. There was no lack of moisture either year. Still the lime had very little effect. It will be noticed that the application of 10 cwt. per acre increased the yield each year, while the application of 1 ton resulted in a slight reduction in each case.

This particular paddock has been cropped for many years, usually giving light returns, and it is now growing a good deal of sorrel; yet the lime, so far, has had very little effect.

Variety Trials for Hay.

Armidale.—The plots here were sown on black heavy land, which had been cropped to oats the previous year. It was ploughed and harrowed in March, and again in June. Sowing took place on 25th July, at the rate of 55 lb. of seed per acre, without fertiliser. The varieties all made very good growth, and were harvested on 26th December, with results which are set out in the accompanying table.



Sunrise Oats at Tenterfield. 48 bushels per acre.

At harvesting time the Ruakura variety was riper than the others, and had been damaged more by a hailstorm just prior to cutting. The White Tartarian was the latest of all, being harvested a little green. Rust was worst on Ruakura, followed by Guyra and Algerian, while the Brown Calcutta and White Tartarian were practically free.

The amount of rainfall was not recorded in the vicinity of the plots, but it would probably range between the 10½ inches that fell at Armidale during the growing period and the 20·32 inches that fell at Uralla.

Tenterfield.—These plots were sown on 9th June on land which was previously cropped with maize for green feed, and which was ploughed in May and harrowed early in June. The seed was sown at 45 lb. per acre, with 56 lb. superphosphate per acre.

Each variety proved very successful and apparently highly suitable for the Tenterfield district. They were sown rather late in the season, otherwise much heavier yields would have been produced. Rust had practically no effect on any of these varieties.

Ravensworth.—These plots were sown originally for green fodder purposes, in comparison with barley and wheat, but were harvested for hay. The land had been previously cropped with maize for grain, but the crop was light. The oats were sown on 5th July, the land having been prepared just previously. The rainfall was very scanty before and after sowing until the end of September, causing short and thin crops. Copious rains fell after September, but rather too late to benefit the crops to any extent.

Ruakura Oats at Tenterfield. 81 bushels per acre.

The samples were all short and fine, also free from rust. The rainfall during the growing period was not recorded near the plots.

OATS Variety Trials for Hay.—Northern Districts, 1916.

Variety.	Armidale.				Tenterfield.				Ravensworth.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	q.	c.	lb.
White Tartarian	2	10	3	0	....				0	15	0	20
Brown Calcutta ...	2	10	1	0	....				....			
Guyra	2	8	0	0	1	10	0	0	....			
Algerian	2	1	0	0	1	10	0	0	0	17	3	12
Ruakura	1	12	2	0	....				1	5	3	16
Sunrise	....				1	8	0	0	....			

Variety Trials for Grain.

The New England tests for grain were conducted at Messrs. J. F. Chick's and A. Sommerlad's farms at Tenterfield, and in the north-west at Mr. J. Carroll's farm at Narrabri and Mr. A. E. Weakley's farm at Currabubula. The results may be summarised as follows:—

OATS Trials for Grain.—Northern and North-western Districts, 1916.

Variety.	J. F. Chick, Tenterfield.	A. Sommerlad, Tenterfield.	J. Carroll, Narrabri.	A. E. Weakley, Currabubula.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Ruakura	39 0	81 0	....	... .
Sunrise	....	48 0	26 33	16 5
Algerian	.. ..	66 0	....	27 0

Sowing took place on 5th April at Mr. Sommerlad's and on 8th June at Mr. Chick's, 1 bushel per acre being sown in each case.

As already mentioned, the plots at Mr. Sommerlad's were originally intended for green feed, but as the varieties appeared so suitable for the district, they were all reserved for seed purposes.

The yield from the Ruakura plot was very heavy, and also that from the Algerian. Sunrise was not so good, but the growth was much taller and more free from rust. Ruakura and Algerian were both lightly rusted.

At two centres in the north-west, plots of oats were sown in conjunction with the wheat plots. The yields are given in the above table.

The seed was sown on 8th May at Narrabri, and on the following day at Currabubula. In each case 40 lb. per acre was the quantity used; no fertiliser was employed. At Currabubula the growth was rather rank, and the Sunrise variety lodged considerably, resulting in portion only being harvested. At Narrabri the plot was eaten off severely during June and July by wallabies, which prevented excessive growth and lodging. Sunrise grew about 6 feet high at Narrabri, and even higher at Currabubula. It was totally free from rust at Narrabri, and only very lightly attacked at Currabubula. Algerian did not grow so tall, and was attacked more by rust.

Conclusions.

The outstanding feature of the oat plots was the remarkable growth made by Sunrise at each centre, and its immunity from rust. Ruakura also promises to be highly satisfactory for green feed and hay, but, unfortunately, it was more rusty than formerly. Algerian upheld its reputation as a dual-purpose variety, and was not badly rusted at any centre.

Weed Seeds and Impurities in Imported Seed.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

FROM the 1st July, 1916, by an arrangement with the Federal authorities, all vegetable and agricultural seeds imported into New South Wales have been tested for weed seeds and impurities, and up to the present about 1,200 samples have been so tested. This work has been carried out in the seed-testing laboratory at the Botanic Gardens, which was built and equipped under the supervision of the Government Botanist in the early part of 1916.

A review of the results of testing the first thousand samples fully justifies the Federal Government's departure. No fewer than 175 samples were found to be impure, some containing such a large percentage of weed seeds as to render the seed unfit and even dangerous for sowing; others contained only a small proportion of impurities. Many samples had either to be condemned, or the cleaning of the seed ordered before it was submitted for sale. Amongst the condemned consignments were three samples of linseed from Japan containing dodder, grass seed from New Zealand containing ergot, cress from the United Kingdom containing a large proportion of Creeping Corn thistle (*Cnicus arvensis*), and oats from Tasmania containing a large proportion of black oats, docks and other obnoxious weeds.

A striking characteristic has been the large number of vegetable seeds containing weed seeds. Almost every sample of carrot seed contained impurities, principally Lamb's Quarters or Fat-hen (*Chenopodium album*), while weed seeds were common in parsley, radish, thyme, cress, and even turnip. One of the commonest weed seeds in linseed was Rocket (*Eruca sativa*), in canary seed Drake or Darnel (*Lolium temulentum*), and in millet seed Pigeon grass (*Setaria* sp.) and Barnyard grass (*Panicum colonum*). Ergot was found in Perennial Rye grass, *Phalaris bulbosa*, and Waipu or Brown Top grass from New Zealand. Docks and rib grass were found in many clovers, and in sufficient quantities to seriously depreciate clover pasture.

The percentages of weed seeds in the samples varied from a trace to 12 per cent. It has to be remembered that a small percentage of the weed often represents a considerable number in a pound of the seed. For example, in a sample of carrot seed from New Zealand the percentage of weed seeds was only 1·5, but this meant 1,200 seeds of Fat-hen and 128 of Bindweed in a pound of the seed. No less than 1,900 seeds of Corn Thistle, a thistle practically unknown in this State, were found in a pound of cress seed from the United Kingdom. It may be said that a percentage of one and upwards of weed seeds will seriously affect the sown crop.

Although in most cases the weed seeds found are already established in this State, some are comparatively rare, and, if given free run, will certainly become a menace. The damage done by weeds, and the expense involved in their suppression, is already considerable, and it is evident that it is only by the examination of imported seed, and its subsequent cleaning, if necessary, that the rarer and more obnoxious weeds can be prevented from spreading throughout the country.

A tabulated list of the weed seeds found in 1,000 samples is here appended :—

WEED SEEDS AND IMPURITIES.

Weed Seeds or Impurities.	Sample containing Seed Impurities.	Country of Origin.	No. of Samples.
Æthusa cynapium (Fool's Parsley).	Linseed ...	India ...	1
Aira sp. (grass)	Meadow Fox-tail grass.	U.K. ...	1
Amaranthus sp. (Red Leg).	Celery	U.S.A. ...	1
	Lettuce ...	U.K. ...	1
	Lettuce ...	U.S.A. ...	1
	Kentucky Blue grass.	N.Z. ...	1
	Rye grass ...	N.Z. ...	1
Ammi sp.	Canary seed ...	Morocco ...	1
Amsinckia sp.	Barley ...	Oregon, U.S.A.	1
Anagallis arvensis (Scarlet Pimpernel).	Lettuce ...	N.Z. ...	1
Anthemis arvensis (Corn Chamomile).	Trefoil ...	U.K. ...	1
Anthoxanthum odoratum (Sweet-scented Vernal grass).	Chewing's Fescue.	N.Z. ...	1
	Poa trivialis ...	N.Z. ...	1
Apium graveolens (Marsh Wort).	Sweet Marjoram.	U.K. ...	1
Apium leptophyllum (Marsh Wort).	Canary seed ...	Morocco ...	1
	Canary seed ...	N.Z. ...	1
Asphodelus fistulosus (Wild Onion).	Linseed ...	India ...	5
Avena fatua (Wild Oat)	Algerian Oats...	Tasmania...	2
	White Oats ...	Tasmania...	1
Brassica sp. (Wild Turnip).	Canary seed ...	Morocco ...	10
	Linseed ...	Japan ...	13
	Linseed ...	India ...	12
	Linseed ...	China ...	1
	Cummin ...	India ...	1
	Radish ...	U.K. ...	2
	Radish ...	N.Z. ...	2
	Millet	Japan ...	3
	Carrot ...	France ...	1
Bromus hordeaceus (Goose grass)	Hard Fescue grass.	N.Z. ...	1
	Sheep's Fescue grass.	N.Z. ...	1
	Perennial Rye grass.	N.Z. ...	1
Bromus sp. ...	Carrot ...	France ...	8
	Carrot ...	England ...	1
	Canary seed ...	Morocco ...	2
	Canary seed ...	England ...	1
	Spinach ...	U.K. ...	1
	Phalaris bulbosa grass.	N.Z. ...	1
	Meadow Fescue grass.	N.Z. ...	1
	Rye grass ...	N.Z. ...	1
	Swede ...	U.K. ...	1
Capsella bursa-pastoris (Shepherd's Purse).	Kentucky Blue grass.	N.Z. ...	1
	Thyme ...	U.K. ...	1
Centaurea melitensis (Maltese Thistle).	Canary seed ...	Morocco ...	1
	Canary seed ...	U.S.A. ...	1
Centaurea nigra (Black Thistle).	Canary seed ...	Morocco ...	1
Centaurea solstitialis (St. Barnaby's Thistle).	Canary seed ...	India ...	1
Centaurea sp. (Thistle)	Cabbage ...	Denmark ...	1
	Clover	Italy ...	1
Cerastium glomeratum (Mouse ear Chickweed).	Italian Rye grass.	N.Z. ...	1
Cerastium sp.	*Agrostis vulgaris* grass.	N.Z. ...	1
Chenopodium album (Lamb's Quarters or Fat-hen).	Carrot	France ...	8
	Carrot	N.Z. ...	7
	Carrot	U.S.A. ...	4
	Cress	U.K. ...	2
	Linseed ...	Japan ...	7
	Parsley ...	U.K. ...	4
	Beet	France ...	1
	Lettuce ...	U.K. ...	1
	Lettuce ...	U.S.A. ...	1
	Endive ...	U.S.A. ...	1
	Turnip... ...	U.K. ...	1
	Lucerne ...	France ...	1
	White Clover ...	U.K. ...	1
	Alsike Clover ...	U.S.A. ...	1
	Rape	Japan ...	1
Chenopodium multifida	Celery	U.S.A. ...	3
	Endive ...	U.S.A. ...	2
Cnicus arvensis (Creeping Corn Thistle).	Cress	U.K. ...	1
Cnicus lanceolatus (Slender Thistle).	Cow grass ...	N.Z. ...	1
Conium maculatum (Hemlock).	*Lotus corniculatus.*	U.K. ...	1
	Cabbage ...	N.Z. ...	1
Convolvulus arvensis (Bindweed).	Canary seed ...	Morocco ...	6
	Millet seed ...	Japan ...	3
	Beet	France ...	1
	Mustard ...	U.K. ...	1
	Linseed ...	India ...	1
Cuscuta epilinum (Dodder).	Fenugreek ...	India ..	1
	Linseed ...	Japan ...	1
Cuscuta racemosa (Dodder).	Linseed ...	Japan ...	1
Cuscuta trifolii (Dodder).	Linseed ...	Japan ...	1
Echium sp.	Canary seed ...	Morocco ...	2
Erodium sp. (Crow Foot).	Canary seed ...	Morocco ...	1
Eruca sativa (Rocket)	Linseed ...	Japan ...	10
	Linseed ...	India ...	8
	Linseed ...	China ...	1
	Rape	Japan ...	1
Euphorbia peplus (Spurge Weed).	Parsley ...	France ...	1
Festuca bromoides (Rats' Tail Fescue).	Crested Dogstail	N.Z. ...	1
	Hard Fescue ...	N.Z. ...	1
	Perennial Rye grass.	N.Z. ...	1

WEED SEEDS AND IMPURITIES—*continued.*

Weed Seeds or Impurities.	Sample containing Seed Impurities.	Country of Origin.	No. of Samples.
Festuca elatior (Tall Fescue).	*Melilotus parviflora.*	N.Z.	1
Festuca myurus (Rats'-tail Fescue).	Oats	Tasmania	1
Fumaria officinalis (Fumitory).	Cummin	India	2
Galium aparine (Cleavers).	Radish	U.K.	6
	Turnip	U.K.	2
	Mustard	U.K.	2
	Radish	N.Z.	1
	Spinach	U.K.	1
	Cabbage	France	1
	Kohl Rabi	U.K.	1
Geranium dissectum (Wild Geranium).	Rib grass	N.Z.	2
	Rye grass	N.Z.	2
	Trifolium incarnatum.	U.K.	1
Glaucium corniculatum	Rib grass	U.K.	1
	Canary seed	Morocco	1
Holcus lanatus (Yorkshire Fog).	Rib grass	N.Z.	2
	Agrostis vulgaris	N.Z.	1
	Chewing's Fescue.	N.Z.	1
	Hard Fescue	N.Z.	1
	Sheep's Fescue	N.Z.	1
Hordeum murinum (Barley grass).	Italian Rye grass.	N.Z.	1
Hordeum sp.	Canary seed	Morocco	1
Hypochæris radicata (Cat's Ear).	Rye grass	N.Z.	7
	Crested Dogstail	N.Z.	3
	Italian Rye grass.	N.Z.	2
	Carrot	U.S.A.	1
	Chewing's Fescue.	N.Z.	1
	Hard Fescue	N.Z.	1
	Phalaris bulbosa	N.Z.	1
Lamium amplexicaule (Henbit Dead Nettle).	Thyme	U.K.	1
Lepidium ruderale (Pepper Wort).	Crested Dogstail.	N.Z.	1
Linum marginale (Wild Flax).	Canary seed	Morocco	3
	Rib grass	N.Z.	1
Lolium italicum (Italian Rye grass).	Canary seed	Morocco	2
Lolium temulentum (Drake or Darnel).	Canary seed	Morocco	18
	Canary seed	U.K.	1
	Linseed	Japan	4
	Oats	Tasmania	2
Lolium perenne (Perennial Rye grass).	Canary seed	Morocco	1
	Phalaris bulbosa	N.Z.	2
	Radish	N.Z.	1
	Carrot	France	1
	Chewing's Fescue.	N.Z.	1
	Hard Fescue	N.Z.	1
	Sheep's Fescue	N.Z.	1
	Rib grass	N.Z.	1
Lolium sp.	Canary seed	Morocco	1
Lychnis sp.	Linseed	Japan	1
Malva parviflora (Small Flowered Mallow).	Canary seed	Morocco	1
Malva sp.	Canary seed	Morocco	5
	Canary seed	London	2
	Rib grass	N.Z.	1
	White Millet	Japan	1
Matricaria inodora (Scentless Mayweed)	Parsley	U.K.	1
Medicago denticulata (Burr Trefoil).	Oats	Tasmania	1
Medicago lupulina (English Trefoil).	Linseed	India	8
	Linseed	Japan	4
	Carrot	U.K.	2
	Carrot	France	1
	Rye grass	N.Z.	1
	Cow grass	N.Z.	1
Medicago maculata (Spotted Trefoil).	*Lotus corniculatus.*	N.Z.	1
Medicago sp.	Carrot	France	3
	Meadow Fescue	N.Z.	1
	Canary Seed	N.Z.	1
Melilotus officinalis (Hexham Scent).	Linseed	India	1
Melilotus parviflora	Cow grass	N.Z.	1
	Canary seed	Morocco	1
Melilotus sp.	Canary seed	Morocco	1
Mentha sp.	Onion	U.K.	1
Myosotis sp. (Wild Forget-Me-Not).	*Poa nemoralis*	N.Z.	1
	Poa trivialis	N.Z.	1
Neslia paniculata	Linseed	India	1
Panicum crus-galli (Barnyard grass).	Millet	Japan	4
	Carrot	N.Z.	2
	Carrot	U.S.A.	2
Panicum miliaceum (French Millet).	Canary seed	Morocco	3
	Canary seed	India	2
	Linseed	Japan	1
	Linseed	India	5
Panicum sp.	Millet	Japan	1
Papaver dubium (Wild Poppy).	Kentucky Blue	N.Z.	2
	Canary seed	Morocco	1
Phalaris minor (Wild Canary grass).	Canary seed	Morocco	1
Phalaris sp.	Raddish	N.Z.	1
	Lettuce	U.S.A.	1
	Perennial Rye grass.	N.Z.	1
Phleum pratense (Timothy grass).	White Clover	U.K.	1
	Alsike Clover	U.K.	1
Picris echoides (Ox Tongue).	Lettuce	America	1
	Lotus corniculatus.	N.Z.	1
Plantago lanceolata (Rib grass or Lamb's Tongue).	Clover	N.Z.	4
	Perennial Rye	N.Z.	2
	Clover	Italy	1
	Clover	U.K.	1
	Crested Dogstail.	N.Z.	1
	Carrot	N.Z.	1
	Lettuce	U.K.	1
	Lotus corniculatus.	N.Z.	1
	Cummin	India	1
	Kidney Vetch	U.K.	1
Poa sp.	Meadow Foxtail	U.K.	1
Polygonum aviculare (Wire Weed).	Parsley	U.K.	1
Polygonum convolvulus (Climbing Buckwheat).	Carrot	France	6
	Carrot	N.Z.	4
	Carrot	U.K.	2
	Beet	U.K.	4
	Radish	U.K.	6
	Linseed	Japan	5
	Cabbage	N.Z.	1
	Cabbage	U.K.	1
	Parsley	N.Z.	1
	Parsley	U.K.	1
	Canary seed	U.K.	1
	Canary seed	Morocco	1
	Millet	Japan	3
	Rape	Japan	1

Weed Seeds and Impurities—*continued.*

Weed Seeds or Impurities.	Sample containing Seed Impurities.	Country of Origin.	No. of Samples.
Polygonum lapathifolium.	Carrot	U.S.A.	9
	Linseed	Japan	5
	Carrot	N.Z.	4
	Kentucky Blue	N.Z.	1
	Radish	N.Z.	1
Polygonum persicaria (Red Shank or Smart Weed).	Carrot	France	3
	Carrot	N.Z.	2
	Parsley	N.Z.	1
	Radish	N.Z.	2
Portulaca oleracea (Purslane).	Thyme	U.K.	1
Ranunculus parviflorus (Wild Buttercup).	Rye grass	N.Z.	2
Ranunculus repens (Wild Buttercup).	Rye grass	N.Z.	1
	Phalaris	N.Z.	1
	Rib grass	N.Z.	1
Raphanus raphanistrum (Wild Radish).	Canary seed	Morocco	1
Raphistrum rugosum	Canary seed	Morocco	1
	Linseed	Japan	1
Rumex acetosella (Sheeps' Sorrel).	Crested Dogstail	N.Z.	3
	Perennial Rye grass.	N.Z.	2
	Carrot	France	1
	Canary seed	Morocco	1
	Poa pratensis	N.Z.	1
	Cow grass	N.Z.	1
	Rib grass	U.K.	1
	Parsley	U.K.	1
	Italian Rye grass.	N.Z.	1
Rumex sp. (Dock)	Carrot	France	3
	Canary seed	Morocco	9
	Lotus corniculatus.	U.K.	1
	Trefoil	N.Z.	1
	Rib grass	N.Z.	2
	Alsike Clover	U.S.A.	2
	Cow grass	N.Z.	1
	Parsley	U.K.	2
	Rye grass	N.Z.	2
	Linseed	Japan	3
	Waipu grass	N.Z.	1
	Cabbage	N.Z.	1
	Rape	China	1
	Canary seed	U.K.	2
Salvia sp.	Rib grass	N.Z.	1
Saponaria vaccaria (Bladder wort).	Canary seed	Morocco	1
Sedge	*Agrostis vulgaris*	N.Z.	2
Senebiera coronopus (Swine's Cress).	Carrot	France	1
Setaria sp. (Pigeon grass).	Millet	Japan	17
	Linseed	India	16
	Carrot	U.S.A.	5
	Carrot	N.Z.	3
	Lettuce	U.S.A.	1
	Lettuce	U.K.	1
	Clover	Italy	1
	Poa trivialis	N.Z.	1
	Hemp	Japan	1
Sherardia arvensis (Field Madder).	Kidney Vetch	N.Z.	2
	Rye grass	N.Z.	1
Sida retusa	Cummin	India	1
Silene dichotoma	Canary seed	Morocco	2
Silene gallica (Catchfly)	Oats	Tasmania	1
Silene inflata (Bladder Campion).	Carrot	France	1
	Trifolium	U.K.	1
Silene sp.	Carrot	France	1
Sorghum sp.	Hemp	Japan	3
Spergula arvensis (Spurrey).	Crested Dogstail.	N.Z.	1
	Parsley	U.K.	2
Spergularia rubra	Canary seed	Japan	1
Stachys sp.	Carrot	France	1
Stellaria graminea (Chickweed).	*Poa nemoralis*	N.Z.	1
Stellaria media (Chickweed).	White Clover	U.K.	1
	Turnip	U.K.	2
	Parsley	U.K.	2
	Canary seed	Morocco	1
	Marjoram	U.K.	1
	Linseed	Japan	1
	Thyme	U.K.	1
	Lettuce	U.S.A.	1
Stellaria sp.	Sweet Marjoram	U.K.	1
Trifolium dubium	Rye grass	N.Z.	1
Trifolium glomeratum	Rye grass	N.Z.	1
	Italian Rye	N.Z.	1
Trifolium minus	Crested Dogstail	N.Z.	2
	Rib grass	U.K.	1
	Italian Rye grass.	N.Z.	2
Trifolium pratense (Red Clover).	Italian Rye grass.	N.Z.	1
	Lotus corniculatus.	N.Z.	1
	Rib grass	U.K.	2
	Linseed	Morocco	1
	Kidney Vetch	N.Z.	1
Trifolium sp.	Algerian Oats	Tasmania	1
	Perennial Rye grass.	N.Z.	1
	Lotus corniculatus.	N.Z.	1
Triticum sp.	Canary seed	Morocco	2
	Millet	Japan	1
	Linseed	India	1
Verbena officinalis (Blue Top).	Sweet Marjoram	U.K.	1
Verbena venosa (Blue Top).	Canary seed	Morocco	5
Vicia villosa (Wild Vetch).	Oats	Tasmania	1
Vicia sp.	Rape	India	1
	Parsley	U.K.	1
	Linseed	India	1
Xanthium spinosum (Bathurst Burr).	Hemp	Japan	2

Weeds of New South Wales.

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Blue Weed or Paterson's Curse (*Echium plantagineum* Linn.).*

Botanical Name.—*Echium*, from the Greek *Echis*, a viper; but, says Hooker, of disputed application. Plants of this genus are called in England "Bugloss or Viper's Bugloss"; *plantagineum*, from a resemblance of the leaves to those of the Lamb's Lettuce (*Plantago*).

E. vulgare Linn., is known in the United States of America as "Blue Weed," "Blue Devil," and "Blue Thistle."

For the origin of the name "Paterson's Curse," see below. I have seen it called "Beggar's Blankets," but the plant usually known by that name is *Verbascum* (Mullein).

Botanical Description.—Genus *Echium* :—

Herbs sometimes shrubby; usually large, stout, hispid or scabrous with tuberous-based hairs. Leaves entire. Flowers white, red, purple, or blue, in spiked or panicled racemes. Calyx 5-partite. Corolla-tube cylindric or funnel-shaped; throat dilated; limb unequally 5-lobed. Filaments unequal, adnate to the corolla below, exserted. Style filiform, stigma 2-lobed. Nutlets 4, inserted by flat bases on the flat receptacle, ovoid or turbinate, wrinkled, scabrid. Distribution.—Chiefly S. Europe and Oriental;

E. plantagineum Linn.; cauline leaves linear-oblong cordate at the base, calyx much shorter than the corolla-tube, cymes elongate, stamens slightly protruded. *E. violaceum*, Brit. Fl. not of L. Cornwall and S.W. of Jersey; fl. June-Aug. Root fusiform, annual or biennial. Stem 1–3 ft., erect or ascending, diffusely branched. Leaves radical 4–6 in., lanceolate, petioled; cauline spreading, obtuse, sometimes dilated at the base. Cymes 4–6 in., spreading, curved. Calyx-lobes subulate-lanceolate. Corolla 1 in., dark blue-purple. Nutlets as in *E. vulgare*. Distribution.—Spain and Mediterranean region to Greece.

I proceed to give the specific description of *E. vulgare* for reasons which will be evident presently.

E. vulgare L.; cauline leaves lanceolate or oblong, rounded at the base, cymes short, calyx exceeding the corolla-tube, stamens much protruded. *E. italicum* Huds., not of L. *Viper's Bugloss.*—Waste ground on light soils in England; an alien or colonist in Scotland. Watson; S.E. of Ireland; fl. June-August. Root fusiform, annual or biennial. Stem 1–3 ft., erect or ascending below, stout, leafy. Radical leaves petioled, 4–8 in.; cauline sessile, acute, rounded at the base. Cymes 1 in. or more, axillary, recurved, lengthening in fruit, panicled towards the ends of the branches; bracts and calyx-lobes linear. Corolla ¾ in., red-purple in bud, then bright blue, rarely white. Nutlets angular, rugose. Distribution.—Europe, N. Africa, W. Siberia, introduced in N. America. (The Students' Flora of the British Islands, 2nd Edition, by Sir J. D. Hooker.)

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* Much of this information was published in Volume XVI, but is reprinted for general information.

Synonyms.—E. plantagineum Linn., is, as Hooker states, a synonym and *E. violaceum*, Brit. Fl., not of Linn.

If we examine Hooker's descriptions of *E. vulgare* Linn., and *E. plantagineum* Linn., we find two important points, viz. :—

E. vulgare :

(1) Cauline leaves lanceolate or oblong, rounded at the base.
(2) Calyx exceeding the corolla-tube.

E. plantagineum :

(1) Cauline leaves linear-oblong, cordate at the base.
(2) Calyx much shorter than the corolla-tube.

Now, if the drawing be consulted, it will be seen that the flowers are those of *E. plantagineum* as regards the important botanical character (2). The arrangement of the inflorescence is also of that species, that of *E. vulgare* being coarser and more crowded.

Coming to the cauline leaves, we find that they are cordate at the base; but if "Illustrations of the British Flora," Fitch and Smith, No. 691, be referred to, it will be found that the cordate base is by no means a prominent character. I therefore name our "Paterson's Curse" *E. plantagineum*, although I admit it is not absolutely typical. But allowance must always be made for a naturalised plant growing under conditions perhaps very different to those of its native country; furthermore, *Echiums* are rather large, coarse plants, and very few herbarium specimens comprise whole plants, including, of course, representative cauline leaves. As a rule, the flowering tops are alone picked off and sent for examination.

Echium is a difficult genus, without a sharp line between some of the species; and it is my intention, if I receive good specimens of the other species acclimatised in Australia, to return to the subject, for the last word has not been said in regard to the Australian forms.

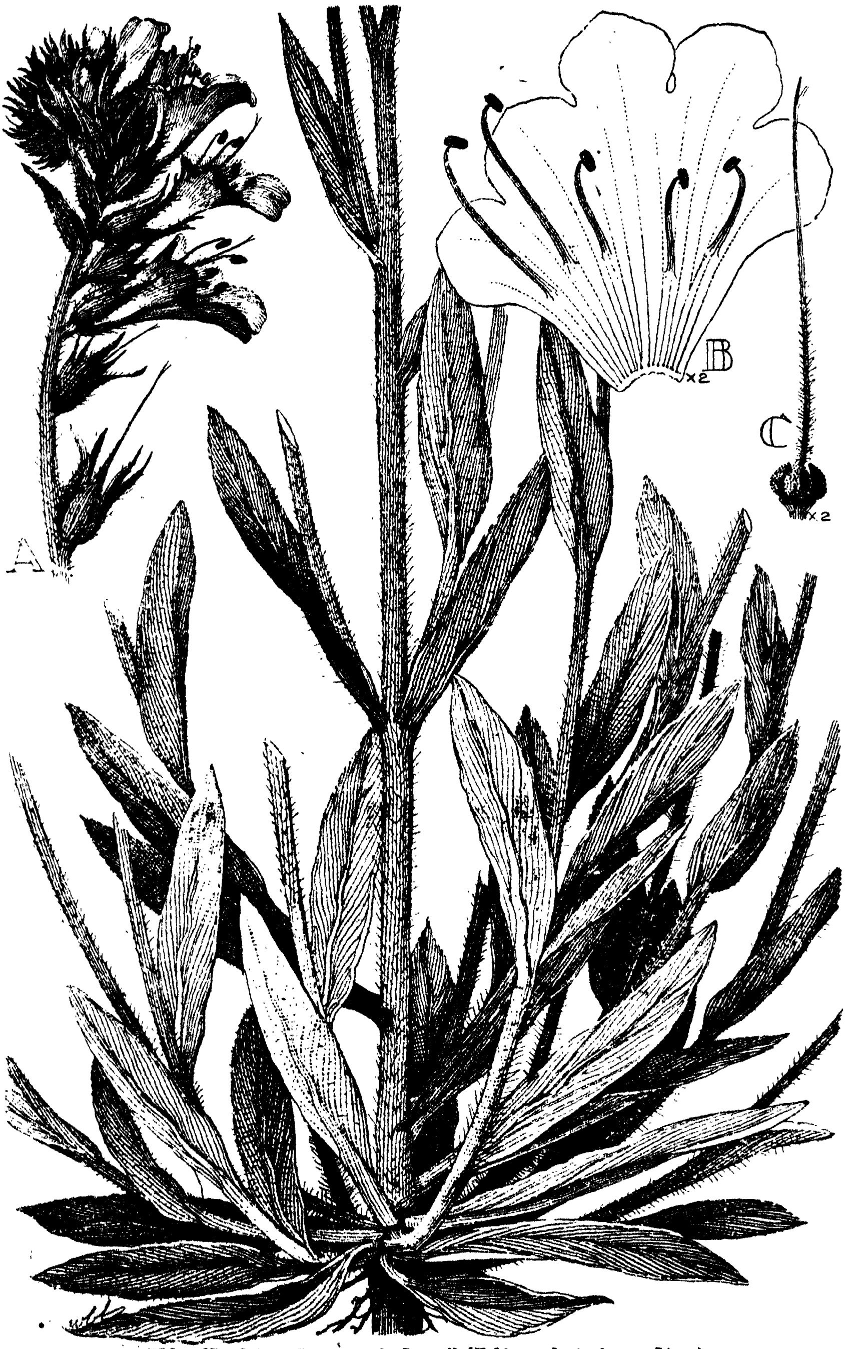
In good land, where the plants are wide apart, I have seen one plant 5 ft. 6 in. high, and up to nine flower-stalks on each, but where it has been established some time it grows as close together as the wheat plants in a crop, and does not stool at all—just grows one straight stalk.—E. A. HAMILTON, Cumberoona, *via* Albury.

Fodder or other uses.—

It is in no way injurious to stock; in fact, in the early spring I consider it one of our best fodder plants, as the first leaves are very succulent, and it is the quickest-growing plant during the frosty weather. When the plant matures, however, the flower-stalk is very rough and hairy, and the stock will not eat it; and then, when it seeds and dies off, all the grass is killed underneath, and there is nothing left on the paddock at all.—E. A. HAMILTON.

That "Paterson's Curse" produces some feed is undoubted, but it is a smothering, rough, coarse plant, whose room is far better than its company. I will deal with the value of the plant in the next section; the vernacular name "Curse" shows what many people think of it.

How to get rid of it.—The intensely bristly character of this weed calls for its destruction wherever it appears. It should be cut out with hoe or mattock



"Blue Weed," or "Paterson's Curse" (*Echium plantagineum* Linn.).

A. Inflorescence. B. Corolla split and opened out. C. Ovarium with style.

WEEDS OF NEW SOUTH WALES.

before it seeds, wherever it begins to make its appearance. Being quite an ornamental plant when in flower, it has been spared for sentimental reasons; that is the danger in the case of a weed such as this.

Both sheep and cattle eat the plant when there is little or no other feed to be had. Mr. P. Hore, of Mugwee Estate, kept a number of sheep in a small paddock last spring that was covered with "Paterson's Curse," and the sheep completely ate it out, and the sheep appeared to do well on it. The worst of the weed is that it chokes all other vegetation, and neither grass or other vegetation will grow near it; and when it dies the ground is left black and unprofitable.—Mr. F. FRENCH, Inspector of Stock, Albury, 18th April, 1904.

A neighbour of ours has got rid of it in a small paddock by running a very large mob of sheep on it and eating it quite bare several times in the year, so preventing it from seeding. By doing this for three years he has his paddock free from it, with the exception of a few plants, which he pulls up as they appear. It is hard to estimate the damage it is doing here, as people have not yet begun to try and get rid of it; but I offered 6s. per acre to have it hand-picked last spring, and it was not accepted. Our neighbour offered a party of Syrians work pulling it up, and they wanted 13s. per acre.—E. A. HAMILTON.

Where found.—

This weed was introduced to this district by the people (Patersons), who lived in a small farm adjoining this estate, as a garden flower about twenty-five years ago. It did not spread much at first, but grew out on a small hill near the house, gradually enlarging every year. However, about eight years ago it got through the fence on to a travelling stock reserve and into our paddocks. Then, as soon as the stock began to travel through it, it spread very quickly, and now it is all over the district, particularly on stock routes and reserves, being carried to these by the stock. There is one patch of about 100 acres in this property, where it is growing as thick as possible; and there the plant merely sends up one flower-stalk to a height of from 1 to 3 feet, but where the plants are growing thinner it grows (on good soil) to a height up to 5 feet, and with a spread across of about 3 feet. Along the road for about 4 miles it is one blue stretch. The plant has spread right up to the head of the Murray, and some local drovers told me they saw it growing at Bourke.—E. A. HAMILTON, Cumberoona, *via* Albury, 15th March, 1904.

There is no question that the plant is spreading. I have seen it or heard of it on reliable evidence from many of the drier parts of this State. Some localities have already been given; others are Dubbo, Nyngan, Paldrumatta Bore, *via* Wilcannia. In Victoria, like New South Wales, it comes from the Upper Murray. It also comes from Geelong. In South Australia it has been sent from the Flinders Range. We have much to learn of its distribution yet.

The country it thrives best in is a rich black soil river frontage country; and the Upper Murray, Cumberoona, Wagra, and that locality, situated from 17 to 30 miles from Albury, is where it is to be seen in the spring growing most luxuriantly, and the purple flower in the valleys, as seen from the surrounding hills, is exactly like water in a lake.—INSPECTOR OF STOCK, Albury.

I have noticed it invariably in close proximity to main roads, being the inference that it was brought there by travelling stock; and the largest extent seen by me was in Cumberoona, about 17 miles above Albury, on the Upper Murray Road. One patch must have covered something like 100 acres, at a rough estimate. Wherever the plant gets a fair hold it completely smothers the grass.—A. H. CHESTERMAN, Staff Surveyor.

I am forwarding, under separate cover, a herb which has, according to report, only appeared on the plains here during the last two or three years—that is, since the sheep came back after being away during the drought. My object in writing is to inquire if it is poisonous, as it is very thick in the wheaten hay crop; and, if not, if it is good feed for stock? At present the stock will not touch it, and, if it is poisonous, can any means be suggested for its eradication, since there are so many patches of it hereabout?—H. P. SMITH, Illilawa, Hay, 1st November, 1904.

The following list of Shires and Municipalities in which this plant has been proclaimed noxious is very formidable, and has been supplied by the Local Government Department, 1917 :—

Name of Shire.
Abercrombie
Berrigan
Bland
Carrathool
Cobbora
Coolamon
Coreen
Crookwell
Culcairn
Gadara
Gilgandra
Goobang

Name of Shire.
Holbrook
Hume
Illabo
Jindalee
Kyeamba
Lachlan
Lockhart
Lyndhurst
Macquarie
Mitchell
Mulwaree

Name of Shire.
Murray
Murrumbidgee
Nurrungal
Narraburra
Timbrebongie
Tumbarumba
Turon
Wakool
Waradgery
Urana
Yallaroi

Name of Municipality.
Albury
Burrowa
Cootamundra
Corowa
Gundagai
Hay
Junee
Murrumburrah
Tumut
Wagga Wagga
Wyalong

The St. John's Wort (*Hypericum perforatum* Linn.).*

Other Vernacular Names.—St. John's Blood (because of the dye produced by the petals). Witch's Herb and Devil's Flight are names associated with old superstitions.

Botanical Name.—*Hypericum,* said to be from two Greek words, uper and eicon (ikon), an image; the superior part of the flower represents a figure, but I am not clear as to the derivation myself;—*perforatum,* Latin, in allusion to the oil-dots of the leaves.

Botanical Description.—An erect glabrous perennial 1 to above 3 feet high, with a woody creeping root difficult to extirpate.

Leaves sessile, opposite, each pair covering those below them, oblong, obtuse, entire, generally about ¾ inch long, of a paler green colour underneath than above, sprinkled with pellucid dots.

Flowers large, bright yellow, in a forked leafy panicle terminating the stem.

Calyx cleft into five lanceolate pointed lobes.

Petals, five.

Stamens numerous, with long filaments more or less distinctly united at the base into three bundles.

Ovary.—Three-celled, with three styles with a terminal stigma.

Fruit.—A dry capsule with rather numerous small seeds. The plant is most easily recognised by the oil-glands on the leaves, which are easily seen when held against the light, and give the leaf a perforated appearance. These oil dots pervade the whole plant, and are mixed with fewer dark purple opaque dots, especially on the flower, where the dark dots are frequently crowded along the margin of the petals as shown in the illustration.

Fodder or Other Uses.—This plant has been used in domestic medicine in Europe from time immemorial, for example, in dysentery, phthisis, for wounds, &c.; oil boiled with the herb is used externally in rheumatism and gout. Mr. Theodor Lüdes, pharmaceutical chemist, of Rolland's Plains, favours me with the following interesting letter concerning it :—

"I dare say it is still used by the peasants on the east coast of Jutland (Denmark) as a tonic in the form of a tincture, prepared by maceration of the flowering tops with *Aqua vitæ* ("Aquavit" the Danish spirituous liquor—a "spiritus aromaticus" flavoured with caraway, fennel, &c.). I remember when I was an apprentice there was a great demand for an *Ol. Hyperic.* prepared *lege artis* from the dried herb and olive oil—said oil was used as a "cure-all" for rheumatism, bruises, &c., &c., but, as a substitute, olive oil (pure and simple), coloured with alkanna root extract, had the same good action as the original article. It is open to doubt if the real *Ol. Hypericanus* had any medicinal properties at all. (Like a lot of other liniments, the rubbing does the trick.*) I have in the end of the eighties made great quantities of *Tinct. Hyperici*, which was sold to a manufacturer of bitters. The tincture is of an aromatic bitter taste, and has, of course, a little flavour from the small quantity of ethereal oil contained. That the different species of Hypericum should be poisonous for cattle I doubt very much, as they are very common as a weed in Denmark. Were they poisonous the farmers there would soon declare war against them."

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* Much of this information was published in Volume XV, but is reprinted for general information.

The petals contain yellow and red dyes, which have been isolated by Dieterich (*Pharm. Centralb*, 1891, 683). The red juice of the flowers was considered by ancient classical writers to be a signature of human blood, and was hence employed as an application to wounds.

Hypericum bacciferum and *H. cayanense* are stated by Simmonds to yield a gamboge. The power of expelling the demon of hypochondriasis and of acting as a charm against witchcraft was formerly attributed to the St. John's Wort of Europe. According to Stowe, it was always suspended over the doorway on the vigil of the saint, with herbs of like fancied power, and in the Pyrenees it is said to be still so used. The holes in the leaves were said to be made by the witches out of spite to its, to them, inconvenient virtues. Nor is this the only *Hypericum* viewed with superstitious awe since antiquity. The old Greeks used a "Hypericon," which is believed by some to be *Hypericum crispum*, by others *H. barbatum* or *H. empetrifolium*. They used also an "Androsaemon," perhaps *H. ciliatum* or *H. hircinum*, or "Koris" (*H. Coris*) and "Askyron" (*H. androsaemon*), a "Dionysias" (*H. androsaemon*), but it is doubtful whether all these names are referred to the precise species.

How to get rid of it.—The best way to get rid of this plant is to pull it up or dig it up before it seeds. I am quite aware that it has taken possession of large areas; this is all the more reason why it should be combated whenever it makes its appearance in new ground. The pulling up can be postponed until the plant is in flower, if need be, but it should always be borne in mind that it is a very free seeder.

EXPLANATION TO PLATE.

St. John's Wort (*Hypericum perforatum* Linn).

A. Flowering stem.
B. Fruit, consisting of 3 carpels. Part of the calyx removed.
C. Horizontal section through ovarium, showing the attachment of the seeds and the large oil-glands.
D. Seed, with reticulate testa.
E. Petal, showing the dark oil-glands.
F. Part of the stem.
Flowers yellow.

The glands on the petals are a little diagrammatic. It must be taken into consideration that the glands are less prominent in the living plant than in the dried plant. The tissue of the petals dries up except the oil glands, which remain unchanged. Oil glands are always more prominent in herbarium specimens than in the living plant.

All Australian specimens belong to a more narrow-leaved form than the common English St. John's Wort.

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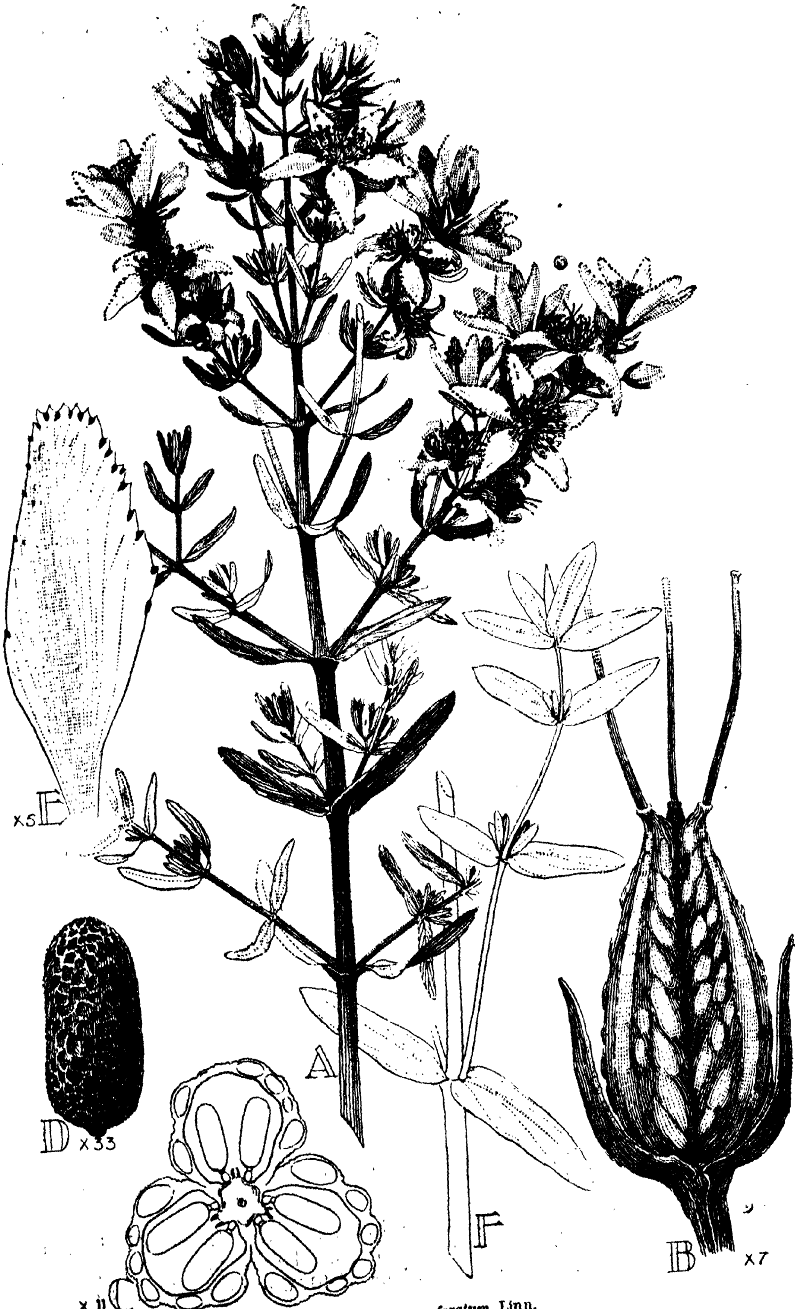
* This professional secret is published for general information.



Hypericum perforatum Linn.

WEEDS OF NEW SOUTH WALES.

Where found.—It is found in the temperate regions of Europe and Asia. It is a troublesome weed in many parts of the United States. It was no doubt introduced here as an ornamental plant, and has shown wonderful colonising powers. It is a pretty little plant, and hence may be tolerated on that account until it makes its insidious hold firmly felt. Baron von Mueller first published the name of this weed in a list of Victorian weeds in the *Victorian Naturalist* for December, 1893. After a visit to Bright in Victoria, where the weed has taken possession of enormous areas, I published a note in the *Victorian Naturalist* for July, 1900, p. 44. In this *Gazette* for October, 1901, p. 1202, I formally recorded this weed for New South Wales—from districts so far apart as Albury and Mudgee. Since then I have received it from scattered localities, and unless steps are taken to check it, it promises to be one of our worst pests.

The following list of Shires and Municipalities in which this pest has been proclaimed is already formidable, and has been furnished by the Local Government Department, 1917 :—

Name of Shire.	Name of Shire.	Name of Municipality.
Coreen	Illabo	Albury
Crookwell	Jindalee	Cootamundra
Culcairn	Mulwaree	Corowa
Dalgety	Narraburra	Junee
Gadara	Tumbarumba (Mitchell)	Tumut
Hastings		Wagga Wagga

THE EFFICIENCY OF A RAM.

WHETHER a ram is as efficient as a sire when the worm-like appendage (sometimes called the "vermiform appendix") has been injured or removed, is a subject about which there is much diversity of opinion among sheep-breeders, and the Department's experience with a ram from which the part was missing, having been cut back to the stump, is therefore of interest. The transfer of a Border Leicester ram from Cowra Experiment Farm to Glen Innes Experiment Farm resulted in attention being drawn to the defect, it being apparent that the injury had been accidentally inflicted during shearing, as, indeed, is very possible, and not uncommon.

The ram's performances as a sire were therefore closely observed. The Manager at Cowra reported that the transfer to Glen Innes had taken place just after the Cowra ewes had begun to mate, but it was certain that five of the lambs dropped in the pure-bred flock were by him, though another ram (a reliable lamb-getter) with another lot of ewes had only got two lambs up to the date at which the other left Cowra.

At Glen Innes it was apparent in the first season that the ram had sired a fair proportion of lambs, but to make more sure he was next season mated singly, and the Manager reported a lambing of 102·6 per cent. in that group of ewes.

Insects and Prickly Pear.

W. W. FROGGATT, F.L.S., Government Entomologist.

ALTHOUGH a great deal of attention has been given to the study of prickly pear during the last twenty years, comparatively little has been written from a popular standpoint about the greatest introduced plant pest in Australia.

In his "Select Extra-Tropical Plants, readily eligible for Industrial Culture or Naturalisation," Baron Von Mueller listed ten species of *Opuntias*. In this *Gazette* Mr. Maiden has published a series of articles, illustrated with coloured plates, dealing with a number of the different species of *Opuntias* that have spread over our waste lands and become a pest over many thousand acres in this State and million of acres in Queensland.

The voluminous report of the Queensland Prickly Pear Travelling Commission, published by Messrs. Tryon and Johnston after their return from a world tour in 1914, and issued as a blue book by the Queensland Government, is the latest contribution to the prickly pear problem. It contains a great deal of interesting information collected in the countries visited, and compiled from reports and records consulted in libraries and museums. It was unfortunate that through the unsettled conditions in Mexico, the Commissioners were debarred from visiting the central home of the Cactus.

In considering the relation of insects to the prickly pear, and the possibility of some insect or insects taking a hand in its destruction, I have made some extracts from this report, and comments on some of the suggestions of the Commissioners regarding insects that might be introduced from abroad into Australia to destroy prickly pear.

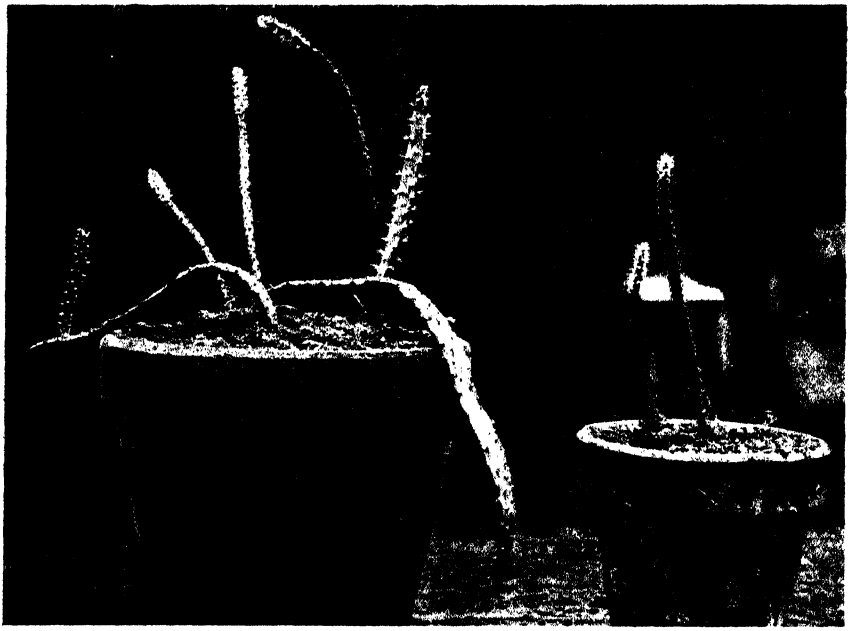
Prickly Pears.

The cacti, popularly known under this name, with a few exceptions belong to the genus *Opuntia*, and at the present time have a very wide range over the habitable world, though their original home is the arid regions of Mexico, ranging north and south into similar lands in North and South America.

Typical desert plants, they have through the ages, in their struggle for existence in inhospitable arid land, evolved a most wonderful resistant structure adapted to meet the peculiar desert conditions of plant life. This consists of a tough fibrous skeleton of elongate, cylindrical, or flattened leaf-like jointed stalks encased in watery fleshy tissue, covered with a fine smooth skin, studded with long slender spines, and rosettes of fine needle-like bristles.

The flower-buds, growing out from the side of the rounded leaf-like stems are pear-shaped in form and expand into large, handsome, circular flowers. The flower falls away, leaving the elongate oval fruit capsule, which encloses a large number of hard reddish seeds, enveloped in soft sweet tissue, pleasant to the taste. Most of the *Opuntias* grow into large clumps of branching stems, springing from a central root, and often, in open forest country, forming impenetrable walls of plants, sometimes climbing upwards among the tree foliage.

Not only are they propagated from the seeds in their abundant fruits, which are eaten by all kinds of birds and animals, and in this manner are widely sown all over the country in their droppings; but also from every broken segment of stem, dropped on the roadside from the parent clump, or tangled in the hair or wool of horses, cattle and sheep, and so carried further afield and dropped, fresh plants spring up, the broken leaf stem having the power of producing roots on the under surface, and fresh stalk buds on the upper one.



Seedling Prickly Pear Plants, from emu droppings, Southern Queensland. Two years in the pots.

Thus it can be easily understood how plants that can hold their own and flourish in desert land, where their succulent stems and fruits would be devoured by the small desert animals, if they were not protected by their spiny armour, when transplanted to rich unoccupied land, with a fairly good rainfall and no enemies, would develop into a vegetable pest of such magnitude.

In the sixteenth century there were no prickly pears in the old world; but the enterprising Spaniards soon introduced them into their native land, first on account of the cochineal insect, also on account of the beauty of their flowers. From Spain, they were carried along on both sides of the Mediterranean right into Asiatic Turkey; and many of the old engravings in books of Eastern travel show clumps of prickly pear. Later on they were introduced into South Africa, where they have spread over a large area; and in India, China, Ceylon and Java, they have also gained a footing and spread into the jungles and waste lands.

In the West Indies the fruits are called "Indian Figs," and hedges of *Opuntia* were planted round the planters' homesteads in Jamaica, to protect them from marauding negroes. On the slopes of Mount Ætna the large bushes of *Opuntia vulgaris* grow among the lava, and produce large crops of purple fruits, which the villagers collect and sell in the local markets. A large yellow-flowering species is very common, growing over the walls of the Turkish gardens in Smyrna and Beyrouth.

In England they were evidently looked upon as rare plants a hundred years ago; for in the *New Monthly Magazine* (October, 1819) is the following note:—"There is now blowing and may be seen at Mr. Delay's, surgeon, near Yately, That rare blooming plant in this country (from Sicily), called the Prickly Pear; it has more than eighty blooms, pears and bloom buds upon it; the best time for viewing it is from eleven o'clock in the morning to four in the afternoon, the flowers being then expanded. It will probably continue a month in bloom."

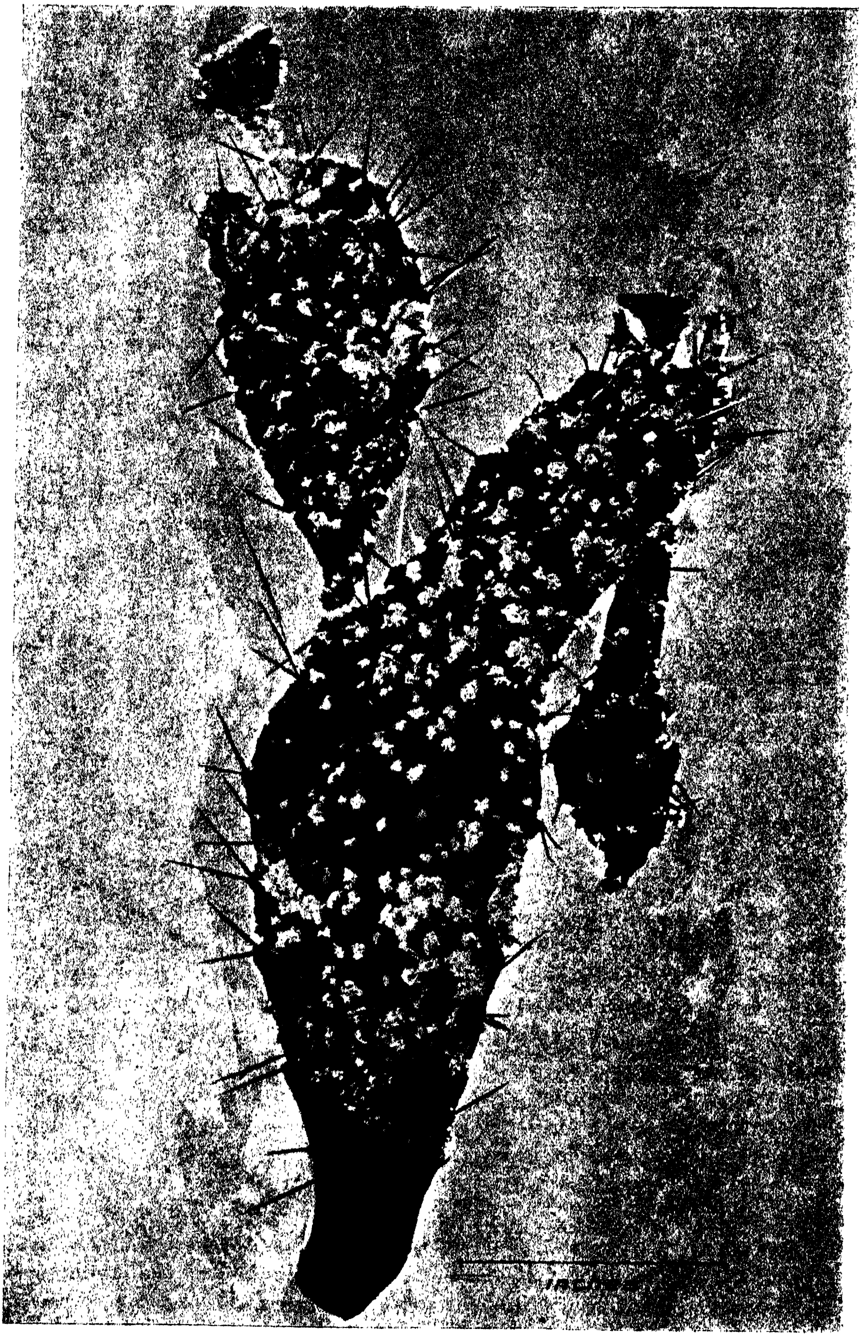
When the first fleet arrived at Botany Bay in 1788, Governor Phillip brought with him specimens of cochineal with its host plant, prickly pear, which he had obtained when calling on the South American coast. It would be interesting to know what became of these particular specimens; later on there were probably many other specimens brought by emigrants in the ships that called at Brazil and the Cape, who collected seeds and plants at every port of call for their new homes.

Prickly pear hedges were very common about homesteads in northern Victoria, New South Wales and Queensland at a very early date, and they remained simply as isolated patches; however, just in the same manner as the rabbits after years of contented settlement suddenly decided to move on, so did the prickly pear, and when once the move on commenced it steadily advanced and is still enlarging its area of pear-infested land.

It is stated on very good authority that the original centre of infestation in New South Wales was from a station garden near Scone; from whence the manager carried them out all over his paddocks with the idea that they would be a good food standby in times of drought. A Queensland squatter visiting this station was so struck with the vivid green of the prickly pear, that on his return he carried with him many cuttings of the "pear" and spread it far and wide on his holding on the Moonbi River, in Southern Queensland.

For many years following, these plants simply held their own, but about 1870 they began to spread. It is interesting to note that Dr. Woolls in his "Contribution to the Flora of New South Wales" published in 1867, dealing with "Plants Introduced Accidentally," does not mention any species of prickly pear.

Some of the local land officers and stock inspectors recognised the danger of prickly pear spreading, but the authorities in power and the landholders took no action, until, like a fire, the prickly pear was beyond bounds, and, spreading on all sides, thousands of square miles of good grass land have been utterly ruined.



Tree Prickly Pear, *Opuntia monacantha*, destroyed by Wild Cochineal (*Coccus indicus*) at the Insectarium in the Botanic Gardens.

INSECTS AND PRICKLY PEAR.

The Cochineal Insect (*Coccus cacti*).

The cochineal insect was originally described and named by Linnæus as *Coccus cacti* in 1758, but there is some doubt about when it actually received scientific recognition; previously it was simply known as *La Cochenille*; Cockerell places it in the genus *Dactylopius*. When the Spaniards landed in Mexico in 1578 they found the Incas cultivating a cactus (afterwards named *Opuntia cochinellifera*, but now placed in the genus *Nopalea*) for the purpose of breeding mealy bugs from which they extracted a rich crimson dye. The natives engaged in this industry called the cacti Nopals, and the cultivation of the plants for the use of the insects "Nopaleros."

Patch of Prickly Pear, *Opuntia monocantha*, near Capetown, destroyed by the Wild Cochineal.

Photo kindly lent by C. W. Mally.

How this valuable dye was obtained was for a long time a carefully-guarded secret by the Spaniards, who, though they carried the insects and cactus to Spain, did not let other nations share it. So important was the acquisition of the Cochineal that the Court of Directors of the East India Company offered a reward of £6,000 to anyone who would introduce it and establish it in India.

When dried cochineal was first placed upon the market some writers stated that they were the dried berries of some unknown trees, and it was some years before the fact was established that they were the dried bodies of a coccid.

When alive, resting upon the surface of the stems of the cactus, the female coccids are enveloped in a mass of white woolly filaments through which the dull red oval insects can be seen clustered together sucking up the sap of the plant through their needle-pointed tubular mouths. When extracted from the woolly secretion, she shows the rounded head and thoracic portion with the distinct segmental divisions of the abdomen, with three pairs of small, short, more or less aborted legs, and a pair of short jointed antennæ. When alive their general colour is red with a silvery bloom; when collected and dried they assume a dull red to blackish tint.

When Humboldt visited Mexico in 1804, he records that the cultivation of cochineal was a very important industry, about 880,000 lb. of the dry insects being exported annually to Europe. The industry was introduced into the Canary Islands in 1825; and, in spite of the labour, the profits were so large that large areas under grain and vines were devoted to growing cactus for the cochineal; and in 1873 it was the chief industry 5,728,000 lb. of dried cochineal, valued at about £555,849, being exported to Europe.

The discovery of aniline dyes has, however, destroyed the cochineal industry, and very little cochineal is used at the present time compared to its consumption twenty-five years ago.

There were a great many attempts to introduce the cochineal insect into different parts of the world; and from the many different species or rather varieties that are now known as "Wild Cochineal Insects," it looks as if climatic conditions are chiefly responsible for the variations.

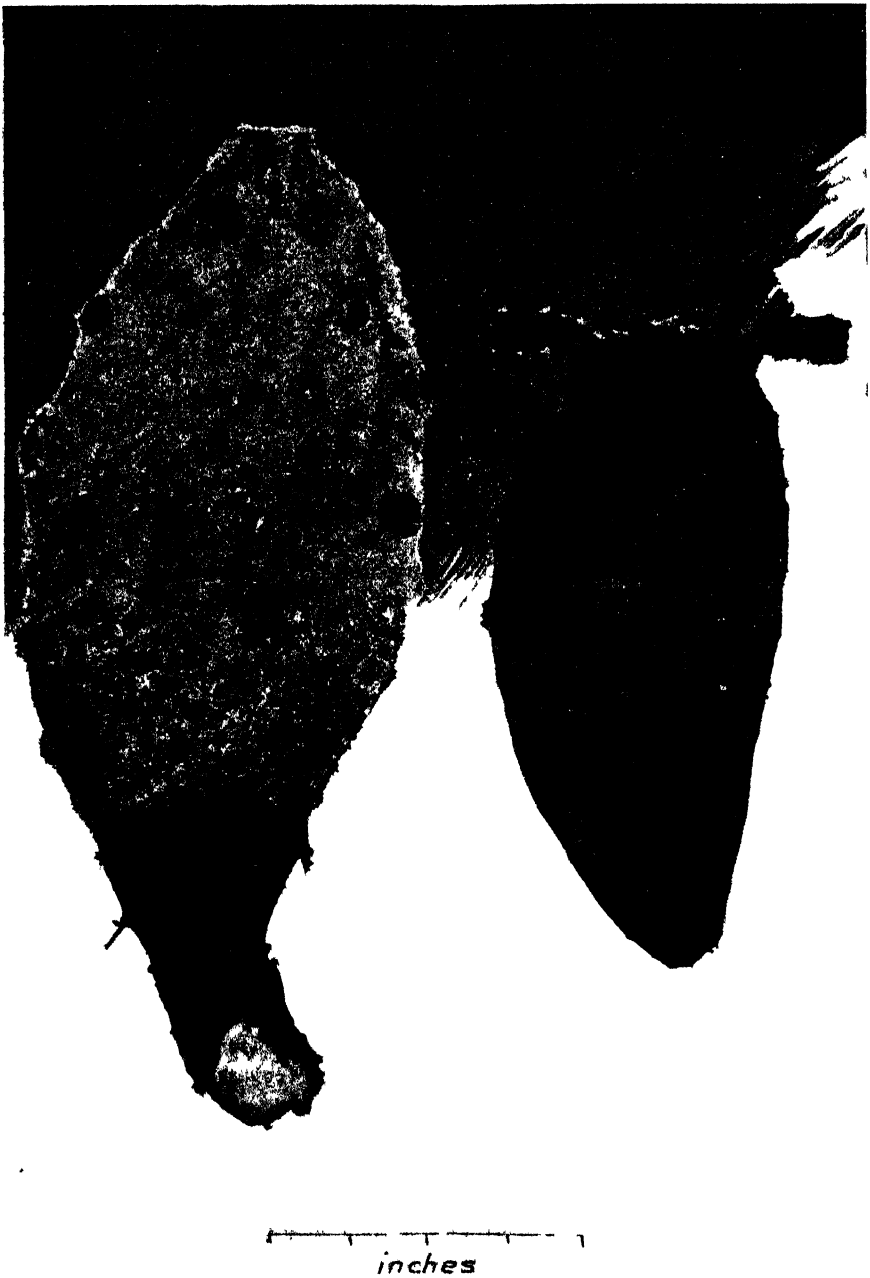
Two species have been given specific rank by Green, *Coccus indicus* found in India and Ceylon, and *Coccus capensis* in South Africa. The latter species is remarkable for being a serious pest to *Opuntia monacantha*, and when it thoroughly infests it, it causes the bushes to die down to the ground.

The Grey Round Cactus Scale.

(*Diaspis calyptroides* Costa; *Diaspis echinocacta* Bouch.)

The synonomy of this armoured scale is somewhat obscure, and which of the two names stands is a matter of priority. Messrs. Maskell and Newstead give the date of Costa's paper, in which the description of this scale is given, as 1827; while in Mrs. Fernald's catalogue the date is given as 1835. In Maskell's paper in the Transactions of the New Zealand Institute, 1897, he describes specimens from India. In the same year Newstead, in the *Entomologists' Monthly Magazine*, records this scale as new to England.

It now has a very wide range, and has probably been spread from Botanic and other public gardens, as it infests a number of different species of cacti. It is common in Australia and infests a number of cacti in the Botanic Gardens at Sydney. Tryon has figured it in Queensland.



The Prickly Pear infested by a Diaspid scale (*Diaspis calyptroides*) at the Insectarium in the Botanic Gardens.

INSECTS AND PRICKLY PEAR

The female scales are almost circular, opaque, white, with a yellowish or buff tint; the central pellicle brown to blackish, and the scale convex. They are usually massed all over the surface of the rounded leaf-stalks, varying much in size, and the enclosed female coccid beneath is of the usual pyriform type, widely rounded on front and narrowed behind. The male scales, smaller than the females, are thickly scattered among them.

Though the infestation of a stem sometimes causes an individual stem to die off, usually the whole plant is very slightly affected by the presence of this scale, even if in large numbers.

The Rutherglen Bug (*Nysius vinitor*).

Among the few records that we have of any of our native insects attacking or infesting prickly pear is that of the killing of prickly pear by Rutherglen bug on an infested area near Mungindi, north of Moree, on the Queensland border. This was during the time of the great drought in the North-West, when everything had dried up, even to the green mustard weed that had formed a thick coat over the soil among the prickly pear. This weed had been the food supply and shelter of countless millions of Rutherglen bugs, which, when the weed dried up, found nothing green but the cactus, and therefore left the sheltering weed and turned their attention to it.

When I visited the district toward the end of summer, large clumps of prickly pear, through the presence of these tiny little silvery-winged bugs, had died down and were simply represented by a heap of dried stems that looked like old shoe leather. There were some scores of these clumps, and the bugs were extending the area of infestation, so that it looked as if the Rutherglen bug, at the time of the writer's visit, was going to solve the prickly pear question.

A few weeks after the rain set in; and, with a wet winter, the surviving bugs left the prickly pear and went back to the native herbage, and the prickly pear regained its normal vigour.

There are two species of very small active plant bugs that swarm in immense numbers all over the inland districts of New South Wales, and are found in the pear-infested country; the species just considered, and the Coon Bug (*Oxycarenus lectulosus*). The last-named, when immature, before the final moult, is bright red, the fully developed wing covers being black and white, and completely covering the red back in the adult fully-developed insect. In the immature stage these little bugs while moving over the herbage, when they come to a fence or log, swarm over it; and the writer has, on the Moree plains, seen a mile of fencing posts tinted a brilliant red through the numbers of these bugs resting upon them.

The Prickly Pear Commissioners, when in the United States, North America, among other insects studied the habits of two plant bugs (*Chelinidea vittigera* and *Narnia pallidicornis*) that are said to confine their attention to different species, and suggested that they might, among other insects, be imported.

Other Insects.

The following notes on Insects damaging Prickly Pear and other Cacti, recorded from the United States and mentioned by the Queensland Travelling Commissioners, may prove of interest. The insects, most of which are mentioned in the United States Department of Agriculture *Bulletin* 113 ("The Principal Cactus Insects of the United States," Messrs. Hunter, Pratt, and Michell, 1912), include species of a number of different families, chiefly plant bugs, coccids, beetles, moths, and flies. Longicorn beetles upon the roots and main stems, though plentiful, do not seem to have much influence upon the vitality of prickly pears. A number of these beetles belong to the genus *Moneilema,* which do not attack any plants except cacti, and would not be likely to adopt new habits in Australia.

The cactus weevils of the genus *Gerstækeria* deposit their eggs on the stalks where the oblong, white, legless grubs feed and pupate. Another group are known as the black cactus weevils; they belong to the genus *Cactophagus,* and the weevils cause similar damage.

Among the Lepidoptera the members of the genus *Melitara* have a wide range over the United States, being found in Texas and Florida. The moths lay their eggs on the surface of the stems, the caterpillars feeding upon the tissue. Though common in Texas they do not appear to do much in checking the growth of the prickly pear; but in Florida, according to Hubbard, *Melitara prodenialis,* a large brown species, destroys a great many of the cultivated cacti in that State.

There is a cactus midge (*Itonida opuntiæ*), belonging to the family *Cecidomyidæ* (gall-flies), which attacks many different species of cacti, and is said to have destroyed species allied to our prickly pear in the United States—not so much by the actual damage it does, but through the fungus spores that enter the surface of the stem through the puncture they cause with their eggs and larvæ.

In their report the Commissioners state that arrangements were made with both the Federal and State Bureaux of Entomology to have consignments of useful insects collected and forwarded to Queensland. It would be interesting to know what steps the Queensland Government have taken in this matter.

A Suggestion for experimenting with a large Land Snail.

Noticing how destructive and fond the common introduced garden snail (*Helix aspersa*) is of cultivated garden cacti, the writer has suggested that experiments might be made by turning out into a prickly-pear area some large land snails. A very large African land snail (*Achatina fulico*), accidentally introduced into Ceylon, has increased and appeared in enormous numbers in one of the country districts.

It is a very prolific species, according to Green (*The Zoologist,* February, 1911), who says: "The maximum number of eggs that may be produced at one time has not been fully determined, but the animal has been known to deposit at least 100 eggs in the first year; and from the examination of several large clutches of eggs, it is probable that the produce of the second year may be as high as 500. Taking into consideration the fact that every individual is a functional female, that the snails breed once a year, and live for at least two years, and allowing for only a brood of 200 in the second year, the rate of increase is a matter of simple calculation. Excluding any casualties, we arrive at the astounding total of 10,930,442,400 (roughly 10,930½ millions) as the possible existing progeny of a single snail in the fifth year."

The fact that this snail would only have a choice of prickly-pear stems and gum-tree foliage would incline them to the more succulent cactus; and they would, while under the shelter of the cactus scrub, be quite happy, but unable to live in the open hot sunlight.

THRIPS ATTACKING FRENCH BEAN FLOWERS.

IN April of this year information was received from Mr. F. Ruff, Wamberal, that thrips were attacking the flowers of French beans, and had so damaged one sowing that no pods were forming on the plants, while other sowings were also suffering, though in a less degree.

As beans are a crop of importance in the district, and this is the first occasion of which the Department has record of thrips attacking these flowers, arrangements were made for Mr. W. W. Froggatt, Government Entomologist, to visit Wamberal. In his report, Mr. Froggatt states that the thrips were said to have first appeared on dandelion flowers, and from them to have passed on to the bean blossoms, upon which they swarmed, evidently feeding on the pollen, and thus causing the flowers to fall without pods being formed. About one acre was badly infested, but other crops were also affected. At the time of his visit, the danger was regarded by Mr. Froggatt as probably over for this season, but growers were advised to watch the thrips carefully, as they were capable of doing considerable damage to the crop, and in another season. Spraying with tobacco and soap—using a spray with sufficient pressure to force the mixture well into the flowers, was recommended, and some tobacco was left with Mr. Ruff with a view to an experiment at a suitable opportunity. Clean cultivation was also advised, especially the turning under, before the beans burst into flower, of all grass, weeds, &c., in which the thrips might harbour.

Subsequently Mr. Ruff reported that he took advantage of the first suitable day to spray a new patch of beans, and he believed that this had saved the crop. He sprayed all but eight rows, and a few days later no thrips were to be seen on the treated rows, except close to some scrub on uncleared land, whereas the unsprayed rows still contained some of the insects. Before the spraying a good deal of rain fell, but it seemed as if no amount of rain would kill them, for on the third day of rain a pumpkin flower that was half full of water was found, when emptied, to contain scores of live thrips. Mr. Ruff's opinion was that all growers should have tobacco handy; he believed it would keep the pest in check if used in time.

The Grape Vine.

NOTES ON ITS INTRODUCTION INTO NEW SOUTH WALES.

(COMPILED FROM OFFICIAL RECORDS.)

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

THE cultivation of the vine is now a very important industry in Australia, chiefly for wine, but also for fresh grapes, and to a less extent for raisins. It may be shown that the Sydney Botanic Gardens took an important part in the establishment of vines in this continent.

"Vines of various sorts" were brought out by the First Fleet from the Cape of Good Hope, according to Collins. No list appears to have been preserved. This was, of course, in 1788, and they would be planted in the Governor's garden, at the east side of Sydney Cove.

The first reference to the growth of the vine I can find is in December, 1790, when Major Ross writes from Norfolk Island (*Hist. Rec. N.S.W.*, I, Part ii, p. 419) as follows:—

> From eight grape vines which I found in His Majesty's garden, and two I found in Lieut. Cresswell's, there are 600 cuttings planted, and all of them are in a flourishing condition; and last August His Excellency the Governor-in-Chief sent 250 cuttings from Port Jackson, all of which are thriving equally well with the others, and some of the old stocks have fruit this year, nor have I any doubt but the whole will bear the fruit next year; and in the course of two or three years I can see no reason why we may not have as much wine made upon this island as will supply New South Wales and this place, and I think it very probable that in a short time they may export wine from this island.

At page 438 he reports, on the 11th February, 1791:—

> The grape vines which came from Sydney last August were immediately planted, and which, together with some cuttings that I had planted just before then, amount now to between 700 and 800, which are all in high perfection, and two or three of the oldest are now bearing.

The next record I can find is on 18th March, 1791, when Mrs. John Macarthur wrote from Sydney:—

> The grape thrives remarkably well. The Governor sent me some bunches this season, as fine as any I ever tasted, and there is little doubt but in a very few years there will be plenty. (*Early Records of the Macarthurs*, p. 40.)

These were probably raised in the old Government House garden on the east side of Sydney Cove.

These were evidently looked upon as preliminary experiments, for we find the Duke of Portland writing to the Governor of New South Wales, under date 22nd April, 1800 (*Hist. Rec. N.S.W.*, iv, 76):—

> As it appears that the soil and climate of New South Wales are favourable to the culture of the grape, there will go out by the Royal Admiral two Frenchmen, who were prisoners of war here, and who appear to have a perfect knowledge of the cultivation of a vineyard and the whole process of making wine, as you will observe by the within documents received from them on this subject. (Not preserved.)

> I trust the employment of these men will enable you in a very short period to cultivate a vineyard for the Crown of such an extent as to allow of your producing, on the spot, whatever wine may be wanted on the public account; and this circumstance will, of course, be the means of promoting, on the part of individuals, the cultivation of the vine and the making of wine throughout the settlement at large.

George Suttor reported to Sir Joseph Banks (28th December, 1800) that he had been able to take alive to New South Wales "the following kinds of vines—Tokay, White Frontignan (Frontiniac in original), White Muscadine, Black Frontignan, Constantia and Muscat of Alexandria."

The two Frenchmen sent out by the Duke of Portland arrived by the Royal Admiral, and were paid £60 per annum each for the term of three years. (King, 10th March, 1801. *Hist. Rec. N.S.W.*, iv, 316.) Their names were Antoine Landrier and François de Riveau, and they were originally prisoners of war at Portsmouth.

These Frenchmen planted one vineyard (with 7,000 plants), but unfortunately those vines "some time planted" have been entirely blighted, &c. (Gov. King, 1st March, 1802. *Hist. Rec. N.S.W.*, iv, 719 (footnote); *Hist. Rec. Aust.*, iii, 405, 435.)

One of the Frenchmen was appointed to the management of the vines, and the other, a cooper, was set to make casks, suitable woods for making casks and hoops having been discovered. Upwards of 12,000 vine cuttings had been planted on the side of a hill at Parramatta at the Crescent, behind the old Government House at Parramatta. (*Hist. Rec. Aust.*, iii, 585, 368.)

On 9th May, 1803, Governor King reported that a few gallons of wine had been made, and he spoke more hopefully in regard to the "blight" which hitherto had been looked upon as accompanying the vine as a matter of course. (*Hist. Rec. Aust.*, iv, 78.) At p. 232, under the same date, he stated, "The Experiment will therefore be made with those grown in the Government garden; upwards of 10,000 (vines) are in a very fine condition, and it is intended to make a very large vine yard at Castle Hill."

On 9th May, 1803, Governor King reported to Lord Hobart (*Hist. Rec. Aust.*, iv, 237) that there were in the Colony "Muscadine (white), Tokay, Red Frontignan (Frontiniac), Constantia. There are several other sorts in the Colony, but have not seen the fruit, the whole subject to desperate blights."

Caley, in the same year (*Hist. Rec.*, v, 294) says: "Grapes do not answer for they are subject to be blighted, even in all stages of growth." See also *Hist. Rec.*, vi, 295.

Under date 1st March, 1804, King (*Hist. Rec. N.S.W.*, v, 317) reported that the Frenchmen knew but little of the business, and that he was sending one home.

So far the importation and cultivation of the vine had been entirely the affair of the Government, and I know of no further steps taken in the matter for a dozen years. The way was now open for private enterprise.

Mrs. Macarthur reported grapes in her garden at Parramatta in 1816. So far I believe the grapes were the product of vines imported on the public account, but now I refer to importation of vines by Captain Macarthur, who, with his sons, must be looked upon as the first private citizens who deliberately set about to study the industry with the view of adapting it to Australian conditions.

Captain Macarthur had been forbidden to return to Australia since Governor Bligh's time, but he was not idle, and on the 1st August, 1816, in a letter to his wife, he refers to his travels, with two of his sons, in France and Switzerland studying the different modes of cultivating the olive and the vine. His exile was coming to an end, and on the 18th February, 1817, he tells her that the Government have promised to fit him up with a green-house for his vines and olives on board the transport in which he intended to return to the colony. (*Early Records of the Macarthurs*, 272, 288.)

In the "Lord Eldon" transport, Captain Macarthur touched at Rio and increased his collection of plants.

In a lecture on "Colonial Vine Culture," by Alan H. Burgoyne, M.P., the well-known merchant in Australian wines, published in the *Journal of the Royal Society of Arts*, for 24th May, 1912, he says :—

> Not a little romance surrounds the introduction [from what has already been stated, this word is not a correct one, as the vine had been introduced in 1788.—J.H.M.] of the vine into Australia. It would seem that in the years 1815-16, at the termination of the Napoleonic campaign, subsequent to the battle of Waterloo, one Captain John MacArthur with his two sons, journeyed on foot from district to district of those parts of Europe whence vines had already come, and where the culture of the vine was the chief feature of the countryside. This journey must have been indeed adventurous, since every high road was infested with footpads and camp followers—those bad characters and human outcasts always so common during and after a long international war.
>
> The result of this extended tramp was a bundle of vine cuttings representative of each district visited. These were taken with not a little jubilation back to the Antipodes, and at once efforts were made to propagate them. These cuttings were found, however, after cultivation until fruit-bearing, to the great dismay of those who had collected them with so much trouble, to be in almost every case worthless.

Following is also a reference to these early discouragements.

In Bigge's Report on the state of Trade, &c. (1823), p. 93, it is stated that the vine has been cultivated in New South Wales from an early period of the establishment of the colony, and one individual (presumably Macarthur) has bestowed much attention upon it, though with very little success. It was added that it is very liable to pests.

The London Society of Arts, in 1822, offered a gold medal for "the finest wine, not less than 20 gallons, of good marketable quality, made from the produce of vineyards in New South Wales," and in 1823 a silver medal was presented to Mr. Gregory Blaxland for wine from his vineyard at Parramatta; while in 1828 the gold one was presented to him for a pipe of wine produced on his vineyard in 1827.

In the *Sydney Gazette* of 16th December, 1824, we read that—

> **The ship "Minerva," Captain Bell, has been instrumental in enriching our Botanic Garden with thirteen varieties of grape vines, amounting in all to 800 cuttings, which were forwarded from the Botanic Garden at the Cape of Good Hope, and prove to be in excellent condition. It was the intention of the Government to distribute them, in the proper season, to those individuals who feel interested in the prosperity of the colony. The following is an enumeration of their varieties, viz. :—"Pontak, Red and White Muscatel, Steen,* large and ordinary Steen, white and red Hannapoort,* Frontignan, Chrystal, Persian, Green Grape, and ordinary Honepoten." [The spelling for Hannapoort in the original.—J.H.M.]**

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* Mr. M. Blunno tells me that the variety Steen would be the Riesling, a variety of the Rhine country. The Hannapoort, which is grown in South Africa, is only the Gordo Blanco or White Muscat.

In 1825 the Australian Agricultural Company, which had its headquarters at Port Stephens, imported a few vines from the Royal Horticultural Society, which then had its gardens at Chiswick, near London.

The importation of vines into Australia was now fairly continuous. On 1st October, 1828, Mr. Fraser (Superintendent, Botanic Gardens, Sydney) reported that the plants and seeds by the "Bengal Merchant" were all in good order except the vines, which had been injured at Hobart Town, through a vessel fouling the "Bengal Merchant."

In the *Sydney Gazette* for November, 1830, we read :—

> In the many advantages to be derived from a general attention to the grape vine in the variety of soil and temperance of climate so prov dentially adapted for its vigorous growth as we possess, cannot fail to ensure its extensive cultivation, and the quality of the samples of wine which have been made, even with our imperfect knowledge, gives an encouraging promise of its future excellence

We now come to an account of the labours of James Busby in the introduction of the vine, and to that gentleman we owe the establishment of the vine in New South Wales on a commercial basis.

The following is a very important letter :—

London, 24th January, 1832.

I HEREWITH enclose you a letter from the Professor of Botany at Montpellier, who is desirous of adding you to the list of his correspondents. You were aware of my design of prosecuting my inquiries respecting the vine, and especially the wish to learn all that could be known relative to the preparation of raisins. After having been only seven weeks in London I embarked for Cadiz, spent some time at the Xeres-de-la-Frontera, where I learned the whole art and mystery of making sherry wine, and thence across the country to Malaga, where they make the fine muscatelle raisins. If the particular kind of grape from which these are made succeeds in New South Wales, it will certainly be one of the most important things that has yet been tried in the colony. Of this you may judge when I tell you that they are only produced in a small district near Malaga, not more than five leagues long and two wide. Beyond these limits the kind of grape will not grow. The consequence is that the produce of an acre of the muscatelle raisins is worth, at 2½d. and 3d. per pound, from £22 to £25, while the common sorts, which they are obliged to cultivate elsewhere, do not yield more than from £4 to £5 an acre. Surely they are at all events worthy of a careful trial. The labours are neither difficult or expensive. From all I have heard of the Illawarra country I am satisfied that as far as regards soil, situation, and exposure, it will completely answer. But I fear the sudden changes of climates. From Malaga I proceeded by sea to the north of Spain, after having engaged two cases of vines cultivated at Xeres, and two of those cultivated at Malaga, to be sent to London as soon as the season would allow of their being sent. I commenced my researches in France at the foot of the Pyrenees, and proceeded by Perpignan, Montpellier, Marseilles, and to the district where they make the French raisins, thence through the Hermitage, Burgundy, and Champaigne districts to Paris, where I remained only eight days. I was altogether about four months absent, and I can now say that including my journey to the Bordeaux in 1822, I have visited almost every wine district of any celebrity in France. I have been careful to collect cuttings of every variety which I found cultivated, and have got to the number of from sixty to seventy. But independently of these I have also made what I call a nursery collection, viz. :—Two cuttings each of 550 varieties (437 of them are the gift of Mr. Delile, of Montpellier, the remainder I purchased from the Royal Nursery of the Luxemburg at Paris). I have tendered this collection to the Secretary of State, for the purpose of founding an experimental garden under your direction. The offer has been accepted, and I believe the Governor will receive a despatch upon the subject by the same ship which conveys this letter.

(Allan) Cunningham and I both agreed in opinion that the nearest paddock to the garden (Botanic) would be a desirable place, but of this you on the spot will be a more competent judge. The French plants are now being repacked at Kew, and will be sent by the next ship. I also intend to present one-third of my vineyard collection to the garden to be propagated for general distribution, the remainder I will send to Shepherd's, who will receive the kinds for his trouble, and this will enable those to purchase from him who are not fortunate enough to get cuttings from the Garden. The remainder I will dispose of by supplying my own more particular friends. I see there has been a controversy between Shepherd and some persons at Parramatta relative to the cause of blight. Surely among the 600 varieties which any French and Spanish collections will form there will be some found which will bear the climate without blighting.

I can only add at present that everything I have seen has tended to strengthen my former opinion of the great importance of vineyards in the colony. I do hope the folks will go on planting. I would now say let them who cannot spare the labour of trenching plant without it. I at one time expected the French collection would be sent by the "John," but I found this would be impracticable, because it is of no great importance, as they will arrive quite in good time for planting out, and in the meantime you can go on preparing the ground.

Cunningham regrets sadly the dry atmosphere and Italian sky of Sydney. He is sadly troubled with rheumatism, and I hope after some time we shall ensure his permanent residence in the colony. What is to be my own destination I am as yet uncertain, but I have very liberal promises. Of one thing I am certain, that I could not live in this country.

(Signed) JAMES BUSBY.

To Mr. C. Fraser, Colonial Botanist.*

This letter, like the rest, has been copied literally, with unimportant omissions : —

Montpellier, France,
29th October, 1831.

YOU will learn by Mr. Busby, the bearer of this letter, that I have not neglected to join him in his views towards improvements of cultivation through your remote country. He has been with us perfectly at liberty to make his choice of cuttings, of vegetables, and of seeds of the garden. His attention was bestowed on practical useful objects. I have, therefore, recommended to him some of our trees, such as *Celtis australis*, called Perpignan wood, which is a matter of employment, and traded through the whole of Europe, for handles of coachdrivers' whips, &c. I have also given him seeds of *Carthamus tinctorius*, a product of Egypt and Spain, the red tops of the flowers serve for dyeing in rosy colours, &c. As I wish to have in return seeds and dried specimens of trees and plants of your country for my scientific pursuits, I beg you to do for supplying Mr. Busby with these articles, all what you will have the most favourable for my purpose. I shall correspond with Mr. Busby and with you through the channel of his friends at London. Any dry plants or seeds may be sent by the channel of the same person, either directly to me, to Montpellier, or to Mr. Benjamin Delessert, rue Montmartre, No. 176, at Paris, with advice to send them to me here. I would prefer the way of Mr. Delessert, because merchants have correspondents in seaports everywhere, and are much less stopped by difficulties too troublesome else to persons unconcerned with business of that sort. . .

(Signed) DELILE,
Director of the Botanic Garden of Montpellier.

To Mr. C. Fraser, Colonial Botanist.

Governor Bourke, under date 4th August, 1832, wrote to the Under Secretary of State acknowledging his letter of the 24th January, directing preparations to be made for receiving into the Botanic Gardens at Sydney a collection of vine cuttings presented by Mr. Busby, and informed him of the safe arrival of the three cases of plants and two boxes of seeds; together with descriptive lists of the vines collected by Mr. Busby, and also a printed catalogue of the Royal Nursery of the Luxembourgh. The cuttings reached this colony in a good state of preservation and had been planted in the Botanic Garden.

Richard Cunningham, the new Superintendent of the Botanic Gardens, left England for Sydney in August, 1832, and brought out with him some open boxes of vines of approved kinds, both for wine and raisins, which had been selected by Mr. Busby in the best wine districts of France and Spain, and to which reference has just been made. In his journal,* published in 1834, he states that he transferred the cases to Kew by Cunningham's invitation, and that that gentleman superintended the packing, "and I feel persuaded that to his care I am, in a great measure, indebted for the excellent condition in which they arrived in Sydney."

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* Mr. Fraser died 31st December, 1831.

The task of making the report of the Botanic Gardens for the 1st July to 31st December, 1833, fell to Mr. John McLean, in the absence of Richard Cunningham, who was absent on the exploratory journey with Major Mitchell that ended in his death. He reports: "The grape vines collected by Mr. Busby on the continent of Europe of 650 varieties; 120 are bearing fruit; every attention has been paid them." Further on, speaking of the annual distribution of plants, he mentioned "a vast number not counted of grape vines, plants and cuttings."

Richard Cunningham, writing under date 13th July, 1833, stated that the vines in the Botanic Gardens were "generally of an unproductive kind."

Mr. McLean wrote to the Colonial Secretary, under date 1st December, 1833, that every care has been taken to preserve the grapes imported by Mr. Busby, and that as many of them are in full bearing, he has placed a watchman day and night in charge of them. The Colonial Secretary urged that additional efforts be taken to preserve the fruits from the depredations of men and birds, it being of the greatest importance that the quality of them should be ascertained and the best brought into cultivation.

On 22nd January, 1833, "362 varieties were alive, and for the most part, healthy," in the Botanic Garden, Sydney. Thus began, in earnest, the wine-growing industry of New South Wales.

Mr. Burgoyne's account (*op. cit.*) varies a little from the official documents I have quoted, and is as follows:—

> In 1831 James Busby brought from Australia to England the first wine made near Sydney in the previous year. [Who made this? Did Gregory Blaxland?—J.H.M.] This was placed before a number of London wine merchants, who described it as a species of Burgundy, and it says much for its manufacture that when some of it, re-exported to Sydney, was opened out there it was found to be perfectly sound.
>
> In 1832 this Mr. Busby obtained, at his own expense, 570 varieties of vines from the collection formed at the instigation of Napoleon by the Comte de Chaptal, at Luxembourg Gardens in Paris, and from Montpellier, even then a leading centre for the scientific study of the vine.
>
> Of these 570 varieties no less than 362 were successfully struck by Mr. McLean, head of the Sydney Botanic Gardens. It must be remembered that these cuttings during transportation, in the first place, had to be kept alive, and, secondly, were upon the sea for from four to eight months.
>
> Busby sent his first selection by a convict ship by permission of the then Secretary of State for the Colonies, and packed the rootlings in cases full of damp moss lined round the sides with damp-proof paper. [Richard Cunningham packed them, and looked after them on the voyage.—J.H.M.]. The man in charge found that a few of them had struck *en voyage*. He therefore planted them on the deck in open boxes, where it was part of the convicts' duty to water them. The method of packing outlined above is, it is interesting to recall, the same as that employed to-day. These vines were subjected to tests by

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* "Journal of a recent visit to the vineyards of Spain and France, forming a guide to the profitable culture of the vine in New South Wales," by James Busby, Esq., of New South Wales. London (1st Ed. 1834, 3rd, 1840).

The work contains a list of vines supplied from the Botanic Garden of Montpellier (433) and from the Luxembourg Garden at Paris (110).

Mr., afterwards Sir William, MacArthur [MacArthur was a member of the testing committee.—J.H.M.], and his first selection of 140 varieties was reduced on further consideration to twenty types as being most suitable for wine making. Mr. William MacArthur planted his vineyard at Camden Park from these cuttings, and to his enterprise and careful discrimination the present high state of viticulture in the Commonwealth is in a large measure due. It is apposite to remark here that every vineyard now in existence in Australia saw its genesis in cuttings supplied from Camden Park.—[This is hardly correct. The Kirkton Vineyard was planted soon after 1832 by Busby from his own vines, and Camden Park received its later vines from Busby, as indeed Mr. Burgoyne has said a few lines higher up.—J.H.M.], and Sir William was at all times careful that only the finest varieties were sent round, and rigidly excluded from his choice the heavy bearing but inferior types which have militated in many districts in other countries against the quality of the wines produced.

James Backhouse (*Extracts from Letters, &c., Part 3rd,* p. 47) says he helped the committee appointed to test Busby's vines in the Botanic Garden (1836). "They have a collection amounting to about 300 varieties. . . . A large proportion of these are wine grapes, but most of the varieties cultivated for the table in England are among them, under their French names."

On 2nd March, 1842, Superintendent Anderson, of the Botanic Gardens, made application to the committee for a "New Edition of the Catalogue of Vines," and it was directed that it be sent to Mr. William Macarthur, of Camden, to be revised.

Mr. James Kellick informed me that in 1848–9 he remembered a number of vines which grew on trellises in the Northern Aviary paddock for many years. In the same place there were a number of sugar canes, which the boys used to steal, and they used also to similarly appropriate the fruit of the passion vines, which then grew on the pergola.

Mr. C. Moore, in his report for 1850, acknowledges receipt of vine cuttings from Germany for distribution. They consisted principally of Early Orleans, Red Burgundy, Asmenshausen and Retdesheimer.

In his 1851 report he stated that a Medicinal bed was constituted out of a bed containing duplicate vines. This would be south-west of the present Ladies' lavatory.

Mr. L. Wooff, formerly a gardener in the Botanic Gardens, told me (1898) that almost the first job he did in New South Wales was the pulling down of the wooden trellises and rooting out the Busby grape vines. This was in August, 1857. The site was in the plot next the creek and immediately in front of the glass-house; the ground was one mass of Nut-grass. I find a reference to the same in *New South Wales Horticultural Magazine*, iii, 80 (April, 1866).

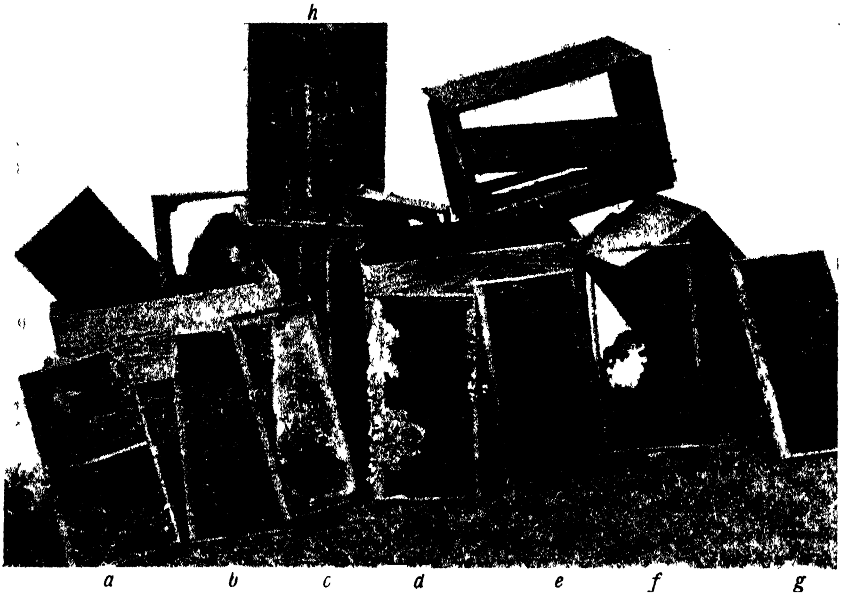
The matter is referred to in Mr. Moore's annual report for 1857, dated 6th July, 1858. Nut-grass (*Cyperus rotundus*) was in those days known as "Bulb or water-grass (*Cyperus Hydra*)." Mr. Moore adds that the ground was used for representatives of the leguminosæ.

From this time onwards, it became unnecessary for the Botanic Gardens to take an active part in the culture of the vine.

On the 16th December, 1868, the Legislative Assembly ordered to be printed a report on the "Disease in Grape Vines" (*Oidium Tuckeri*), 4 pages fcp. It would appear that Mr. Coxen, of Queensland, first, in Australia, noticed this disease in the summer of 1866. We have now arrived at modern times.

BEE MOTHS IN NEW SOUTH WALES APIARIES.

A SOMEWHAT exceptional case of infestation by bee-moth has come under notice, and forms the subject of the accompanying illustration. In the apiary where this was found every hive, on examination, proved to be completely eaten out by the pest, a result which can only be attributed to neglect and want of knowledge on the part of the owner. Obviously such hives had to be completely destroyed, as they formed a centre of infestation for the whole district, as there were thousands of moths



A Menace to every Neighbouring Bee Farmer.

a and *b* Frames containing comb completely riddled by larvæ
c. New comb with the portion containing brood affected, and the portion containing honey quite free.
d Comb completely eaten away, and thousands of the cocoons of the moth in evidence
e and *g* A network of moth larvæ
f Comb practically eaten away
h. The eight frames were completely webbed together and could be taken out as one mass

The black bee is in every case the harbourer of the bee-moth, and as a pure Italian colony will not allow the moth or its larvæ to remain among its combs, there are manifest advantages in Italianising.

Attention may be drawn to Section 5 of the Apiaries Act, 1916, which says: "Every beekeeper in whose apiary any disease appears shall, immediately after first becoming aware of its presence, send written notice thereof to the Minister for Agriculture or to an Inspector."—A. E. IBBOTSON, Apiary Inspector.

The Double-purpose Spray.

RESULTS OF ADDING LEAD ARSENATE TO OTHER SPRAYING MIXTURES.

A. A. RAMSAY, Chemist's Branch, Department of Agriculture.

THE advantage of being able to mix arsenate of lead—an insecticide—with sprays whose chief purpose is to act as a fungicide is obvious, but changes in the chemical combination may take place which render the resulting mixture quite harmful to the plants.

The most satisfactory way to handle the problem is probably to try it on a small scale and judge by results obtained, but this is not always possible and takes considerable time. This question has been approached in an analytical manner—by a chemical examination of the resulting mixtures—and it is thought that the results obtained may be of interest to orchardists and others.

The following have been examined:—

1. Lead arsenate with soap added.
2. Bordeaux mixture with lead arsenate added.
3. Lime-sulphur mixture with lead arsenate added.

1. *Lead Arsenate with Soap.*—Lead arsenate is generally used at a strength of about 2 lb. to 50 gallons of water, and about 7 lb. of soap is sometimes added. This would be equivalent to a mixture of 3·99 grams lead arsenate, 13·98 grams soap in 1,000 c.c. water.

Two samples of well-manufactured lead arsenate, A and B, were tried in the following manner:—3·99 grams of arsenate of lead alone was made up to 1,000 c.c. with pure water, and the same quantity of lead arsenate plus soap was also made up to 1,000 c.c. The solutions were shaken at frequent intervals, and after four days the solutions were filtered and examined.

The following table gives the results of the analyses:—

	Without Soap.		With Soap.		For Comparison.	
	Amounts (grams) present in 1,000 c.c. Solution after 4 days.		Amounts (grams) present in 1,000 c.c. Solution after 4 days.		Amounts (grams) present in the 4 grams lead arsenate used.	
	Arsenic Acid.	Lead Oxide.	Arsenic Acid.	Lead Oxide.	Arsenic Acid.	Lead Oxide.
Sample A ...	·0100	·0074	·529	·053	1·1212	2·558
Sample B ...	·0097	·0057	·654	·090	1·1736	2·440

It will be noted that in the lead arsenates themselves the ratio of As_2O_5 to PbO is 1:2·28 and 1:2·08 respectively. In the case where no soap is used the ratio of As_2O_5 to PbO is 1:0·74 and 1:0·58, and where soap has been used 1:0·10 and 1:0·14 respectively. Clearly lead arsenate has not gone into solution as such.

In the case where soap was used what has occurred is that the lead arsenate has reacted with the sodium oleate (soap), forming lead oleate and sodium arsenate.

Sodium arsenate is soluble in water; lead arsenate is not. We note also that 47·2 per cent. of the total arsenic acid present has gone into solution in four days in the case of Sample A, and 55·72 per cent. of the total arsenic acid in the case of B. Therefore soap must not be added to lead arsenate, for by so doing sodium arsenate is formed, which is soluble and therefore injurious.

2. *Bordeaux Mixture with Lead Arsenate added.*—Bordeaux mixture was prepared according to the Departmental formula—winter strength. This is 6 lb. bluestone, 4 lb. lime to 22 gallons water. To this mixture lead arsenates A and B were added at the rate of 2 lb. to each 50 gallons. The mixtures were shaken at frequent intervals, and at the end of two days were filtered and examined.

The following table sets forth the results of the analyses:—

	Sample A.	Sample B.	For Comparison.	
			Sample A.	Sample B.
	Grams in Solution per 1,000 c.c. mixture.	Grams in Solution per 1,000 c.c. mixture.	Grams in Solution per 1,000 c.c. water.	Grams in Solution per 1,000 c.c. water.
Arsenic acid ...	·0140	·0128	·0100	·0097

It will be noted that the soluble arsenic found in Bordeaux mixture plus lead arsenate is not materially different from that found when lead arsenate was treated with pure water.

The increase is about one-third, but the actual amount is still infinitesimal. No danger need therefore be feared from soluble arsenic in such a mixture.

3. *Lime-sulphur Mixture with Lead Arsenate added.*—Lime-sulphur mixture of winter strength (3½° Bé=1·025 sp. gravity) was used, and to this lead arsenates, A and B, were added at the rate of 2 lb. to each 50 gallons.

The mixtures were shaken at frequent intervals, and at the end of two days the mixtures were examined.

The following table sets forth the results of the analyses:—

	Using Lead Arsenate	Using Lead Arsenate	For Comparison.	
	A.	B.	A.	B.
	Found in Solution per 1,000 c.c. mixture.	Found in Solution per 1,000 c.c. mixture.	Found in Solution per 1,000 c.c. water.	Found in Solution per 1,000 c.c. water.
Arsenic acid ...	·0125	·0128	·0100	·0097

The soluble arsenic in the mixed spray is not materially different from that found on treating lead arsenate with pure water; the actual amounts averaging ·013 in the first case and ·010 in the second case.

Therefore no danger from soluble arsenic need be feared when using such a mixture. In mixing lead arsenate with lime-sulphur the precipitate formed appears essentially to consist of lead sulphide, calcium arsenate, and hydroxy-calcium sulphide.

Lime-sulphur mixture of winter strength contains about 31·96 lb. total sulphur and 12·3 lb. lime per 100 gallons. After the reaction with the lead arsenate takes place the mixture would contain about 31½ lb. sulphur and 11½ lb. lime per 100 gallons, which is, practically speaking, a negligible reduction of strength.

In the absence of any State or Commonwealth definition of what constitutes "lead arsenate," we may take the statement in the American Act. For the purposes of that Act lead arsenate is deemed to be adulterated if—(1) it contains more than 50 per cent. water; (2) if it contains total arsenic equivalent to less than 12½ per cent. arsenic oxide; (3) if it contains arsenic in water-soluble form equivalent to more than ·75 per cent. arsenic oxide; and (4) if any substances have been mixed and packed with it so as to lower or injuriously affect its quality or strength.

Taking the statement (3) that lead arsenate must not yield more than ·75 per cent. of water-soluble arsenic acid, 4 grains of such lead arsenate (the quantity taken in the experiments above described) must not yield more than ·0300 grams water-soluble arsenic acid. The water-soluble arsenic acid yielded by the 4 grams lead arsenate used has been:—

I—With water	·0099 grams.
II—With Bordeaux mixture	·0134 „
III—With Lime-sulphur	·0126 „

These amounts are approximately one-third of the amount of water-soluble arsenic acid permitted to be present in a lead arsenate.

The foregoing experiments indicate that:—

1. Soap should not be mixed with lead arsenate.
2. Lead arsenate may be added to Bordeaux mixture with safety.
3. Lead arsenate may be added to Lime-sulphur mixture with safety.

AGRICULTURAL LENDING LIBRARY.

THE Principal Librarian of the Public Library of New South Wales desires that attention should be drawn to the Country Reference Section, in which parcels of from one to three reference works are lent for one month from date of issue (unless an extension of time be applied for and granted). These books are forwarded by post only, and are lent free of all charge, excepting the return postage, which must be paid by the borrowers.

The section includes a large number of valuable works on agricultural and allied subjects, such as bee culture, fruit growing, poultry farming, dairy farming, horse breeding, sheep raising, veterinary science, &c., and readers of the *Gazette* who desire to supplement their knowledge in this direction are invited to get into communication with the Public Library and obtain further details of the scheme.

COTTON-GROWING IN THE NEW HEBRIDES.

THE following letter will be read with interest by all those who hope to see Australia self-contained as regards its production of cotton. But it would appear from the data supplied that there are few places in New South Wales where the conditions are similar to those described, and the gross return per acre leaves little profit for the producer:—

Port Stanley, Malekula, New Hebrides.

I HAVE lately read an article in your *Gazette* entitled "Cotton-growing in Australia." Being a cotton-grower on a fairly large scale I was interested in the experiments which you are conducting in New South Wales, and the thought has occurred to me that perhaps a few words from me might be of assistance.

Cotton requires considerable moisture for the first four or five months. It should be sown during rainy weather. With us the plants grow to a considerable size, and are planted from 8 feet to 12 feet apart, both in the row and between the rows, according to variety. Sea Island is planted 8 feet x 8 feet; Caledonian dwarf, 9 feet x 9 feet; and Caravonica, 12 feet x 12 feet. Though all varieties do equally well, we find that the best return, taking everything into consideration, comes from the Caledonian dwarf, and for these reasons:—It is exceptionally hardy, of compact habit, and does not deteriorate to any great extent during successive seasons, being of fixed perennial growth. It is an immense cropper and has the considerable advantage of hanging to the plant for a long period after it has ripened, and will stand a lot of rain whilst hanging without being damaged. Being of the kidney variety it is very easily picked, and consequently a considerably greater quantity can be picked in a day—from one-third to one-half as much again as Sea Island. Samples have lately been valued in England at 1s. 2d. per lb., with Sea Island, from here, at 2s.

In these islands the rainy season starts in December and planting starts then, being continued till the end of February. As before stated, it is planted 9 feet x 9 feet—some plant 10 feet x 10 feet -the seeds being planted about 1 inch deep, and with nothing done to the ground beyond cleaning. As a rule, one bunch of kidneys is planted in each hole, afterwards thinning out to the strongest, leaving one in each hole, and the ground kept free of grass and weeds until they attain a good size, when their own shade prevents weeds from growing. Picking usually starts about June, according to the time the seed was planted. We calculate that one man can keep 4 acres picked clean, going over the plants about every ten days. There is a main crop, after which there is a short spell, when fresh growth starts and a second crop grows, the yield being about half the yield of the first crop. One good native boy or woman can pick 60 lb. of bolls in a 9-hour day without much exertion. It is easy, pleasant work, and well suited to white people, and youngsters can do almost as much as an adult. A conservative estimate of yield in good ground, per acre, is half a ton of cotton in the boll. The present local price is in the neighbourhood of 5d. per kilogram, or about £20 per ton. In Australia possibly a better price could be obtained, as there would be a better market and lower freight charges.

I should say, providing the climate and soil are suitable, that cotton ought to prove a payable crop in the hotter parts of New South Wales, but a district with too much rain, or rain extending over too long a period, would not be suitable. Cotton only wants rain during its early growth. It is the easiest of crops to grow, and requires the minimum of attention. At the end of the season, and during the rainy season, the plants are cut back to about 3 feet from the ground—just slashed off with a cane knife—preserving the natural rounded shape as much as possible. After this, growth starts again for the succeeding season's crop. The plants will go on being remunerative for about four years. Rich soil is not the best, as it encourages too much leaf and wood, the soils of medium quality giving the best results.

A plot of 10 acres, as recommended in your article, could easily be grown and harvested by a family, and the work being very light, those who could not take up ordinary agriculture would find it a suitable occupation to indulge in. The yield (in the boll) from 10 acres should be 5 tons, which in Australia ought to bring £20 per ton. The cotton is packed in ordinary chaff bags, which can be bought second-hand for about 6d. each, and with good ramming, a ton can be put into fifteen or sixteen bags. If the industry was taken up by groups of families, a co-operative ginning mill could be successfully worked and the extra profit would go into the pockets of the shareholders. In any case one mill would serve a considerable district, the charge for ginning being usually 1d. per lb., or as an alternative, the mill taking the seed. Working this way, instead of selling the cotton in the boll, each grower could send his cotton to the mill, paying 1d. per lb. for ginning, and could then send his cotton to market as lint, making a considerable saving in freight, and getting the benefit of any extra profit. I very much doubt if £14 per ton could be obtained for the seed, at any rate, it is not our local experience.

I have very little faith in cotton-picking machines, as the waste would more than counterbalance any saving in cost. As cotton grows in these parts, no machine could go through the crop without tearing the plants to pieces. At 9 feet x 9 feet apart, the branches touch.

SUMMARY.

Variety, Caledonian Dwarf.

Seed planted during rainy weather in the wet season.

Plants spaced 9 feet x 9 feet. When full grown at this distance, the leaves meet. Seed sown 1 inch deep, and preferably a kidney to each hole. The reason for this is that the plants come up in a bunch, and by the combined force push clear of the soil.

Ground not cultivated or even stumped—just burnt clean and thoroughly weeded, the seed being hoed in like maize.

Picking starts eight to nine months from sowing. Usually two crops in the season.

One man can keep 4 acres picked clean, going over the plants about every ten days.

One active, intelligent man or woman can pick easily 60 lb. of cotton in the boll per day, *i.e.*, about 11s. worth, at £20 a ton. This is an extremely low estimate. In the United States of America a day's picking for one man runs into hundreds of lbs.

Average yield per acre, ¼ ton.

About thirteen months from planting, plants cut back to within about 3 feet from ground by slashing with a cane knife.

Plants remain profitable for about four years, cutting back each year, though increasing the distance from the ground each year, *i.e.*, cutting back the young mature wood to within about 6 inches from where it joins the previous season's wood. The long shoots should be pinched back to promote a bushy shape and prevent the cotton from getting out of reach.—EWAN CORLETTE, Port Stanley, Malekula, New Hebrides.

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed

Poultry Notes.

JUNE.

JAMES HADLINGTON, Poultry Expert.

POULTRY farmers will now be entering upon not only the busiest but the most important time of the year, because on the measure of success attained during the next three or four months in hatching and rearing the chickens will depend the profitableness or otherwise of next year's operations. It is well to remember, too, that if the high prices obtainable for eggs at this time of the year are to be secured one must look twelve months ahead, because the poultry farmer must look for his winter layers to stock hatched early, not necessarily this particular month, but during the next three months. What early hatching involves was told in last month's notes, but the subject is of such transcendent importance to poultry keepers and the industry generally that it cannot be over-emphasised. The difference between the results from early and late-hatched stock is often the difference between a paying and a non-paying farm.

Incubators and their Management.

Those who have files of these notes, dating back to July, 1915, will be in possession of hints on the above, but since there will be hundreds of new readers the subject, being seasonable, is again referred to.

It should be understood that all standard patterns of incubators are adjusted before being sent out by the maker; this is, however, in so far as the balance of the machine itself is concerned, and is usually termed the "manufacturer's adjustment." But in the case of second-hand machines it often occurs that this balance has been disturbed by the moving of the balance weight, by strained levers, or even by missing parts. This will necessitate readjustment. Such factors should always be taken into account when starting an incubator not previously used by the operator. Many failures to hatch from causes of this kind come under the writer's notice. Another common mistake is for the novice to consider that an incubator is entirely self-regulating, simply because it is styled as such. It should be remembered that the self-regulating device will only regulate the machine within certain limits, and that adjustments on the part of the operator are necessary from time to time to meet the changes in temperature as well as in the heat of the eggs themselves, consequent upon the development of animal heat by the embryos as the hatch progresses.

Testing Thermometers.

At the commencement of an incubating season all thermometers should be tested. It does not follow that because a thermometer runs true one season it will remain so. These instruments are liable to get out of order, hence the necessity for frequent testings. Where a number of thermometers are in use they may be put into a vessel of warm water at, say, about 106 degrees Fah., and allowed to remain in it until the temperature recedes a few degrees; if there is any discrepancy in the temperatures registered, it will of course be necessary to find out which are right and which are wrong. If among the number there is only one or two showing variations from the rest it can be generally concluded that the minority are wrong. However, the safest plan is to procure a tested thermometer with which to compare them.

Management of the Lamp.

The management of an ordinary kerosene lamp would appear to be a simple matter, yet there are quite a number of people who are not well instructed in their use in an incubator, with the consequence that much risk is run through lack of such knowledge. One of the greatest dangers, both as regards running at a higher temperature than the control is set for, and the danger of fire, is the surroundings of the incubator lamp as compared with an ordinary kerosene lamp burning under open conditions. Incubator lamps and also brooder lamps are of necessity surrounded by casements which retain a good deal of the heat emitted by the lamp. The high temperature in which the lamp is worked leads to an increase in capillary attraction, and also to the formation of gases varying in proportion to the temperature surrounding it; this leads to an increase in the volume of light and is why a light left on an incubator lamp is often found much higher later on. This is the primary cause of many fires; the light having attained a volume in excess of what is allowed for in the construction of the chamber there is imperfect combustion, and as a consequence the lamp smokes, soot is formed, and flakes of this are apt to fall on the lamp, and a fire is the result.

The procedure in attending to an incubator or brooder lamp is something as follows:—The vessel should be filled with oil, but not too full; that is to say leave some space with the double purpose of allowing air to get to the oil to minimise the formation of gases, and also to ensure that the oil cannot swab up into the burner, which would at once cause it to fire. If a new wick has to be put in, cut the surface as level as possible, nipping off the corners slightly; light the lamp and let it burn for a few seconds, then smooth over the surface again to get rid of any streaks in the light caused by the jagged edges of the cotton, such streaks being almost sure to cause the lamp to smoke. After the insertion of a new wick and trimming it as described, it will be necessary to watch it for a few minutes to see that the lamp is burning normally before being left. Lamps should be filled and wicks trimmed regularly every day. In the latter operation a tooth brush is about the best thing to brush over the burner to remove the incrustation. Burners should be boiled occasionally in soapsuds; the wicks should not be continuously cut, as cutting is only advisable when the wick is charred too far down. When trimming, the best thing is to raise the wick above the level of the sleeve, remove the charred portion—lower the wick again—smooth over, then light, and see if the flame is level, if not dab the wick while still alight on the uneven portion; this will ensure an even burning light. Only the best brands kerosene should be used.

Artificial Incubation.

The temperature of the incubator should be got up to about 103 degrees Fah., and remain steady for at least a few hours before putting in the eggs. This, of course, reduces the temperature, but in a few hours it should again have reached 102, or about that, except in very cold weather, when some hours longer may be required to reach that point, but this is of little consequence, provided the heat steadily rises to 102 under twelve hours. That temperature is about right for the first half of the time, after which it may be raised a degree. The thermometer bulb should be placed so that it just clears the eggs.

A good practice is to leave the eggs unturned for the first thirty-six hours after setting, and thereafter to turn and put back the eggs twice daily, at first allowing no more time than is actually necessary for the turning operation, but gradually increasing the period of exposure to the air by about one minute per day. The cooling would thus be from three to five minutes at the beginning of incubation, from ten to fifteen minutes about the end of the second week, and in very warm weather up to twenty-five minutes about the nineteenth day. After the ninth day turning once a day will be sufficient.

The eggs should be tested on the sixth day, and the time occupied in this should be abbreviated as much as possible, for it has a bad effect on the embyro chicken to allow the eggs to be out too long in the early stages, say, up to the fifth or sixth day; it is not unlikely that many eggs are weakened in this way. If they are being tested slowly they should be covered with a piece of flannel.

It is also necessary to remember that some operators will take twice as long as others to turn the eggs, and that the weather conditions also require to be studied. If the incubator room be cold, ten minutes, even well on in the hatch, is sufficient exposure.

Applied moisture is of no importance, because in a properly constructed incubator eggs are found to hatch equally well with or without it; personally I prefer no moisture, even in hot-air machines.

At hatching time, as soon as the first egg is chipped, no more cooling or turning should be allowed. It is well to stop turning after the eighteenth day. The temperature is all the better kept at 104 or 105 degrees after the first egg is chipped. At this stage the ventilators are better nearly closed.

AFTER consultation with the Department of Agriculture, the Principal Librarian, Sydney, has decided to establish a library for the circulation of agricultural literature amongst the various branches of the Agricultural Bureau. Several sets of about thirty books, each dealing with all departments of agriculture and allied subjects, are now available for loan to branches, and secretaries whose members desire to participate in the advantages of the circulation should make application to the Principal Librarian, Sydney.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Cattai.

A meeting, which was attended by fifteen members of the branch, was held on 20th April. The first part of the evening was given over to business connected with the branch's exhibit at the show of the Hawkesbury District Agricultural Association. Subsequently a discussion took place on citrus canker and curly leaf on peach trees. A considerable variety of opinion as to the cause of the latter disease was disclosed.

Coobang.

A meeting was held on 7th May, at which there was a good attendance of members. After formal business had been disposed of, a discussion took place on the breeding of pigs. The subject proved to be interesting and instructive.

Coradgery.

Copies of the last issue of the journal of this branch have been received by the Department. The booklet consists of twenty-four pages, containing a record of the proceedings of the branch during the past year. It contains a number of the papers read at the meetings, the harvest reports submitted by members, the results of the farmers' experiment plots in the district, and the report of the judge on the last seed-wheat competition conducted by the branch.

It is to be hoped that the annual appearance of this booklet will continue, as it renders available in a permanent form the transactions of a very live branch of the Bureau.

A meeting of the branch was held on 31st March, when it was decided to endeavour to inaugurate a New South Wales Farmers' Free Gift to the British Government, to take the form of a parcel of wheat, the 1917 product of one acre of the land of each contributor. The Hon. Secretary states that other branches are being circularised with a view to their co-operation.

Mr. J. Clatworthy's resignation from the office of Secretary was accepted with expressions of regret, and Mr. M. J. Kelk was appointed his successor.

THE BLOW-FLY PEST.

This subject had been set down for discussion.

Mr. J. L. WHITMILL advocated the use of a solution of bluestone for affected sheep, having himself found it the best of all methods tried, but he thought much good could be accomplished by going to the root of the trouble and poisoning the flies. He had heard of good results being achieved in other districts by this method. The plan was to put out baits in water poisoned with arsenic, at the camps, troughs, or tanks where the sheep most frequently camped.

The meeting decided to give poisoning a trial, and the Secretary was instructed to prepare and send to all members a circular, urging them to take concerted and immediate action and giving full particulars as to how to prepare the baits.

Following are particulars of the mixture and bait which it is proposed to use: In a kerosene tin bucket put 1 lb. of arsenic and 2 lb. washing soda; then fill up with water and place on a fire to boil. Watch it closely as it comes to the boil, for it readily boils over. Move it to the side of the fire quickly as it comes to the boil. There let it simmer for twenty minutes to half an hour, stirring occasionally; but avoid inhaling the steam.

Open a kerosene tin at the side and put in some of the poisoned water; then put in a dead rabbit or any similar bait (some float this on a board so as to expose more of it to the flies). Hang up at any place where the sheep camp; just high enough to be out of danger. A piece of wire netting over the top to prevent birds eating the bait is advisable.

Mr. W. Moss said that he had treated his ewe hoggets by swabbing the crutch with a mixture of 1 lb. arsenic, 2 lb. soda, and 1 cake of Sunlight soap to 4 gallons of water. This had to be boiled to dissolve the arsenic. This had been done three weeks before, and up to the time of the meeting none of his hoggets had been struck, whilst other sheep not so treated had become badly affected.

DEPARTMENTAL NOTE.—The Government Entomologist remarks in connection with the poisoned bait, that if arsenic is made up, 1½ lb. washing soda is sufficient to dissolve 1 lb. of arsenic, but it requires to be boiled in 4 gallons of water for a couple of hours. If arsenite of soda is used it can be purchased from wholesale chemists at 7d. per lb. for packets up to 28 lb., and 6d. per lb. for ½ cwt. It only requires to be mixed in boiling water, and is quite as effective as the arsenic and soda; 1½ lb. is equal to a pound of the arsenic and soda mixture. The mixture will kill flies if mixed with up to 8 gallons of water.

Cordeaux-Goondarin.

A meeting was held on 25th April, at which fourteen members of the branch attended.

Mr. G. Walker was appointed Hon. Secretary in the place of Mr. F. A. March, who has volunteered for Active Service. General regret was expressed at Mr. March's departure, members testifying that he had been mainly instrumental in the success of the branch.

Mr. March stated that before his return he hoped to visit the fruit-growing districts of England and America.

Mr. George Gilchrist read a paper on the vine and its culture, in the course of which he outlined the methods adopted in England of producing grapes of the finest quality for the requirements of first-class hotels and similar places. Thinning was advocated as ensuring better and larger bunches.

A discussion took place afterwards, the consensus of opinion being that it would not be commercially profitable to specialise on large fruit, the vine itself being so prolific in this country.

The members were entertained by Mr. and Mrs. Woodyatt at the close of the meeting.

Cotta Walla.

A meeting was held on 1st May, at which Mr. J. J. Wray submitted a report on the wheat and oat experiment plots conducted in the district. The results were as follows:—

Variety.	Seed per acre.	Superphosphate per acre.	Yield.
	lb.	lb.	
Yandilla King Wheat	60	55	20·51 bushels per acre.
Rymer ,, ...	52	55	22·41 ,, ,,
Marshall's No. 3 ,, ...	48	55	22·4 ,, ,,
Cleveland ,, ...	48	55	24·57 ,, ,,
Red Rust-proof Oats	75	55	16·25 bushels per plot.
Guyra ,, ...	75	55	33·29 bushels per acre.
Algerian ,, ...	75	70	38·5 ,, ,,
Algerian ,, ...	75	84	33·35 ,, ,,
Algerian ,, ...	75	No manure.	35·11 ,, ,,
Algerian ,, ...	75	55	34·22 ,, ,,

The plots were sown on the 11th and 12th May, 1916, and harvested in January, 1917. The rainfall at Crookwell for each month was:—May, 74 points; June, 666 points; July, 461 points; August, 565 points; September, 292 points; October, 461 points; November, 545 points; December, 365 points. Total, 34·37 inches.

The rainfall much affected the manurial test in the oat section, so that the returns are practically of no value. A portion of the Red Rust-proof oat plot, situated on low-lying land, was completely destroyed by the excessive rain. Cleveland wheat, although the latest in maturing, showed the greatest resistance to rust, which seriously affected the other varieties.

Altogether the plots were a success, and local farmers showed their interest by visiting the plots during the different stages of growth.

French's Forest.

The meeting of this branch was held on 28th April last. There was a good discussion on a paper on underground drainage, read by Mr. W. Davis.

Mr. Davis stated that soils that are ill-drained never produce good crops of fruit, vegetables, or, in fact, crops of any kind. In order to drain the surplus water from the land, drains should be opened 2 to 3 feet deep, running from the highest point to the lowest, and at the same grade all the way through. The distance between the drains would vary according to the nature of the soil; generally they were placed 10 feet to 100 feet apart. Agricultural pipes should be laid in the bottom of the drain, which should be filled in first with brush and then with soil. These made the most effective and lasting drains. For the main drain 3-inch pipes should be used, and for the lateral drains 1½-inch pipes. If pipes were not procurable, loose rubble should be thrown in and covered with flat stones or straight timber, laid side by side and covered with brush. White ants were liable to become established in such a drain, and therefore, in an orchard, would endanger the trees.

A pruning demonstration under the auspices of this branch was conducted at Mr. John Haigh's orchard on 12th May by Mr. W. le Gay Brereton, Assistant Fruit Expert. The Secretary reports that members passed a very pleasant and instructive afternoon.

Kellyville.

A meeting of this branch was held on 5th May, the Chairman presiding.

The pruning demonstration recently given by Mr. W. le Gay Brereton, Assistant Fruit Expert, was discussed, the Chairman explaining the methods used for the benefit of those members who had been prevented by weather from attending the demonstration.

Other matters discussed were the adulteration of pollard, the Chairman's visit to the Fruit-growers' Conference, and co-operation among the fruit-growers of the district.

Leech's Gully.

At a meeting of this branch on 1st May, a paper was read by Mr. P. Sommerlad, of which the following is a summary.

PIG-RAISING.

The phase of the industry I propose to specially deal with is the profitable raising of pigs in the absence of either skim-milk or buttermilk. The question is often asked whether the grazing method pays, and my reply is in the affirmative, providing the soil is suitable for the growing of lucerne or some other legume.

The pigs must be bred on the farm. The sows should be selected from large litters. I prefer pure Berkshires, as they produce the maximum of ham for the minimum of side; when fat they are always attractive to buyers, and withal they are quick maturers. It is often objected that the Berkshires have small litters, but pigs are often selected for breeders because of their appearance, though they would consistently farrow only five to six pigs. This has not been the case in my experience, where a sow that farrowed eleven to thirteen founded the herd. To-day three of her descendants are kept, and they farrowed thirty-six between them, rearing twenty-nine pigs, which shows that prolificness can be kept up if care is also exercised in regard to the sire.

Have all the sows come in at one time, or as nearly so as possible. That will economise time and material when boiling foods, and (perhaps more important for this district) the larger the lot the better the chance of selling when the mob is ready.

When mating do not have the sows too fat or too low; but see that both boar and sow are in good healthy condition. This is very important in the production of large litters of even-sized pigs. It may help still further to mate when the sow first shows sexual heat, and again two days later. I would strongly advise making, as far as possible, pets of breeding sows, as by attention at farrowing time, many pigs can be saved, and this attention cannot be given unless the sow is quiet. Have a 6-inch board in the brood sows' house, about 10 inches from the floor. This will save the crushing of many young pigs. If the sows have had to be locked up for some time prior to farrowing, do not omit to feed liberally with bran about twice daily for about a week before farrowing, as this keeps the sows relaxed. Continue the bran with the addition of pollard or oilcake for a few days after farrowing, and, if the weather be cold, feed all slops warm, increasing the allowance after the first week.

At the end of the fourth week, castrate all young boars, as not only is the wound then small, but they have the advantage of the mother's nourishment a few weeks before weaning. At about this time, the young pigs will be seen entering the trough and drinking the slops given to the mother, so provide a trough where she cannot interfere, and feed a little of the same food with the addition of a little grain.

Make provision for a continuous supply of food. Lucerne is the king fodder, and if a plot be over twelve months old, it may safely be grazed by sows, either turning them on when the young pigs are old enough to follow the mother, or having the sows farrow in portable houses adjacent to the lucerne patch. The latter is by far the better plan, as the sows will the sooner be able to get to the lucerne, and in a few days there will be a supply of milk sufficient for the large litter so much desired. No green food will produce the abundance of milk that lucerne will, nor will any food other than milk produce such big frames in the young pigs. If the soil will not grow lucerne, it will not, in all probability, grow red or any other of the useful clovers, but red clover is worth a serious effort to establish, as it is a very excellent pig food. Rape is about the next best thing, and pigs eat it greedily and thrive. If a farmer will liberally treat half an acre with farmyard manure, prepare the soil well, and seed with Prairie grass early in the autumn, he will be astonished at the great quantity of beautiful feed there will be available all winter and spring, and in fact, all the year, provided the weather is favourable. It stands grazing better than any of the cereal green feeds, and grows more rapidly after a shower or when eaten off. Rye, barley or wheat may also be used, but the one that will give the greatest satisfaction at a minimum of trouble is lucerne. Quite apart from its superior feeding qualities, it possesses two distinct advantages over most of the other foods—(1) in being less liable to injury through grazing, provided it is well managed, and (2) in its ready response to a shower, whereas a dry spell will in all probability spoil rape, rye, &c., for further grazing. Pigs should not be allowed to run on lucerne during wet weather, as this compacts the soil and tends to hasten the evaporation of moisture.

For winter feed, especially for the sows, grow mangolds, swede turnips, pumpkins, or pie-melons, but if I were forced to use these for the young pigs, I should certainly mix and boil them. I have tried artichokes, but they do not do well in my soil. There is still another crop to which the pig farmer should pay attention, especially where he desires to sell his pigs as fats. This is the cowpea. If sown as late as 1st January it will mature a fine crop of seed, provided the soil be not too rich, in which case it will run almost entirely to vine. When the seed is hardening, the forward pigs may be turned in. This crop is at home in our district, and while providing a very excellent fattening food for the pigs, the farmer has the satisfaction of knowing that his soil is being improved for the succeeding crop, which should be a cereal.

When the young pigs are 7 or 8 weeks old their mother should be taken away from them. In this connection the grazing method has a special value. It is often difficult under ordinary conditions to keep a sow within bounds when she begins to feel the accumulation of milk and the separation from her young, but it is infinitely harder to hold the young ones in a strange run; worse—they will spend the next few days in endeavouring to get out, and fretting instead of eating and sleeping, and consequently will receive a set-back. But let them be turned out to graze and the sow be removed afterwards and they will go right on with their grazing, apparently not missing the mother. If all the sows farrow at the one time, and if the lucerne has been subdivided so as to accommodate not more than ten in each division, with a portable house and trough for each litter on land adjacent to the lucerne, where all the feeding of slops, &c., and consequent tramping will be done, the lucerne will be saved from damage.

Now those young grunters must be made to show a good daily gain. The lucerne will be their chief food, and as there is no skim-milk, a little pollard should be mixed with the water given them; this must be done regularly and at least three times daily. Give a little corn in the cob at each meal, increasing the quantity as they grow; also increase the liquids given, but not necessarily the pollard, as it is too dear generally to feed at a profit. Keep the young stock well bedded, and see that they are not crowded at the trough. The maize here serves a double purpose, as some will be eating while others are drinking. Keep them free from hog lice by the use of sheep dip or wood preserving oil diluted with kerosene. Change the places of the different mobs occasionally. By the time the sows are ready to occupy the lucerne again for the next farrowing, these pigs will be 6 months old, and will be ready to be topped off. For this purpose they must be locked in small yards and fed a more liberal supply of grain, boiled pumpkin, &c., and turned into the cowpeas if such a crop has been provided. After a month of this treatment they should, at least, have attained 120 lb., and be ready for the market.

Lidcombe.

A meeting was held on 7th April, at which Mr. J. Seccombe, of Canley Vale, gave an interesting lecture on the cultivation of strawberries. The lecturer recommended the Creswell Seedling and Phenomenal as the best varieties for the district. He recommended planting 15 inches apart and the rows 2 feet apart, and emphasised the necessity of heavy mulching.

On Saturday, 5th May, Mr. W. le Gay Brereton, Assistant Fruit Expert, gave a pruning demonstration in the orchards of Messrs. Anderson and Bambury. Forty-two members were present, and all took a keen interest in the methods advocated by Mr. Brereton, who also answered numerous questions put by the members.

Little Plain.

The annual meeting of this branch was held on 3rd May. The election of officers resulted as follows:—Chairman, Mr. W. White, senior; Vice-Chairmen, Messrs. W. Leader and J. Hobbs; Treasurer, Mr. S. Smith; Hon. Secretary, Mr. F. S. Stening; Auditor, Mr. E. T. Bateson. The balance-sheet showed a credit balance of £9 18s. 6d.

Lower Portland.

The usual monthly meeting was held on 2nd April and was well attended. Mr. A. McLean read an interesting paper on gardening, dealing with many important points. The paper was followed by a considerable discussion, and a hearty vote of thanks was accorded the reader.

The branch held an exhibition in the local School of Arts on 8th May. The schedule provided for 126 classes in farm products, fruit-growing, horticulture, dairying, apiculture, &c.

The classes were generally well filled, and there were also several non-competitive exhibits. A large gathering was present, including a number of visitors from considerable distances. The exhibition was opened by Mr. H. W. Potts, Principal of Hawkesbury Agricultural College, who, after referring to the excellent work carried out by organisations similar to the Agricultural Bureau in America, South Australia, and Tasmania, said that the exhibition was a credit to the members, and showed how they were working for the progress and development of the district.

It is to be hoped that the branch will be able to make this effort an annual one, as the exhibition was undoubtedly of much educational value.

Matcham.

Owing to the regretted death of the Chairman, Mr. George Pritchard, only formal business was transacted at the meeting fixed for 14th April.

At a meeting held on 5th May, eighteen members were present. Mr. W. Sharpe read a paper on rotation of crops, which was followed by a spirited discussion.

Middle Dural.

A meeting was held on 5th May at which eleven members were in attendance. The meeting took the form of a general discussion on the oil-sprays used during the present season, the organisation of fruit-growers, and arrangements for a pruning demonstration during this season.

Miller's Forest.

A meeting of this branch was held on 1st May, when the question of reviving interest in the work of the branch was discussed, and the election of officers resulted in the following being chosen:—Chairman, Mr. James Priddle; Vice-Chairman, Mr. Thos. Cunningham; Hon. Secretary, Mr. A. J. O'Brien; Treasurer, Mr. J. Broderick; Programme Committee, Messrs. J. Priddle, G. King, and A. J. O'Brien.

MAIZE EXPERIMENTS.

Mr. JOHN PERRETT, who had charge of the experiment plot at Miller's Forest, exhibited four very fine samples of maize grown on the plot. The sample of Red Hogan was a very fine one, being of great depth and heavy in weight. The length of the cob was also exceptional, and the variety is essentially the one for the district. Improved Yellow Dent was also commented on as a very good maize that would do well; the grain was hardly as deep or as weighty as the Red Hogan. The sample of Hickory King was a poor one, and it would be inadvisable to grow this variety at Miller's Forest. Leaming was also approved as weighty, productive of a wonderful yield, and taking a large quantity in the bag. Mr. Perrett said he regarded the maize as very satisfactory on the whole.

DEPARTMENTAL NOTE.—The Chief Inspector remarks, with reference to the above, that it is more than likely that the Hickory King variety became cross-fertilised. The strain of Hickory King which the Department has on hand is a particularly good one, but there is no doubt that late maturing varieties such as Improved Yellow Dent will give better results at Miller's Forest than earlier maturing varieties such as Hickory King.

Orangeville.

The branch displayed a non-competitive exhibit at the recent Camden show. The exhibit was made up of farm and orchard produce, preserved fruits, jams, and preserves and dairy produce.

A photograph of the exhibit has been received by the Department. The exhibit was a comprehensive one, and must have been of a decidedly educational value.

Rawsonville.

A meeting was held on 11th April, at which Mr. Harvey read a paper on the bot-fly, from which are taken the following paragraphs :—

THE HORSE BOT-FLY (*Gasterophilus equi*).

The bot-fly is about half an inch in length. When flying it appears to be of a light brown colour, but upon a closer examination it will be found it is covered with yellow and black hair on the abdomen, and yellow only on the head. The male is shorter than the female fly; the abdomen of the female is long and pointed, and is always carried curled up beneath the body. When on the wing the bot-fly can easily be recognised by the peculiar humming noise it makes, which causes horses to be very restive, and sometimes makes it impossible to work them while a fly is about. The fly has no sting, and does not bite, yet horses seem to know by instinct that it is an enemy.

The flies lay their eggs on the hairs of the horse, beneath the jaws and behind the front legs being favourite places. The eggs are covered with a sticky matter that causes them to be glued fast to the hairs of the horse. They are dirty white in colour, and about the size of a pin's head; the shape is that of an ordinary hen egg. These eggs get into the horse's mouth, by being rubbed off into the chaff at the feeder, or licked off with the tongue. When the egg hatches (the result of the warmth of the horse's stomach) the little maggot attaches itself to the coating of the stomach by means of two little sharp hooks at the head, and feeds there till properly developed, when it is carried through the horse and voided with the dung. The larva then burrows into the soil, and in warm weather the perfect fly is developed in about six weeks. The larvæ are about three-quarters of an inch long; and are yellowish-brown in colour. They attach themselves to the membrane of the stomach by means of the hooks before-mentioned, causing a scar. The segments of the larva have small fleshy, black-tipped spines ringed around them, and can be easily discerned when the stomach is opened. The bot never makes holes in the stomach, and some men of experience contend that they do no harm and would not cause a beast to die, but it is generally recognised that when horses are badly infested, they lose flesh and are weakened in constitution, and if another disease is contracted the horse's chances of recovery are lessened.

A number of drenches are recommended to purge the bots from the stomach, but none of them are very successful. The best one is 2 oz. of turpentine and 20 oz. of linseed oil, given as a draught.

To destroy the eggs, or to prevent them from being deposited on the hairs of the horse, is the best method of dealing with the pest. A mixture of kerosene and fat rubbed on the jaws and on other parts of the horse that the fly favours is a good plan. The smell is distasteful to the fly, and the eggs will not stick to the greasy hairs. The eggs are easily noticed on a horse and can be brushed off and destroyed.

Spencer.

A meeting of this branch was held on 28th April, when a discussion took place on co-operation in connection with the fruit industry.

The Chairman, who had been one of the delegates at the Fruit-growers' Conference held at Sydney at Easter-time, produced samples of American and Italian lemons and compared them with local fruit. It was agreed by all present that in every respect the last was quite equal to the others. An import duty of 5s. per bushel case on the imported article was unanimously advocated.

A paper on fruit drying was read and discussed by members.

Tallawang.

The annual meeting of this branch was held on 7th April, when the annual report and financial statement were read. The report showed that nine meetings had been held during the year and the branch had done very useful work. The enrolment of financial members stood at twenty-three.

The branch had been instrumental in introducing Sudan grass and other grasses to the district, and in having a farmers' experiment plot commenced in conjunction with the Department.

The purchase by the branch of a drenching-bit and veterinary syringe for the use of members had proved a useful innovation.

Toronto.

A meeting was held on 8th May. A considerable amount of business relating to the affairs of the branch was disposed of, and a discussion took place regarding the holding of a show of cut flowers, pot plants, and vegetables. A committee was appointed to draft a schedule for such a show, to be held in October.

Walla Walla.

At the April meeting of this branch a discussion took place on the cost of producing and marketing an acre of wheat. After considerable discussion it was agreed that the following statements, based on actual experience, represented fair averages for the district :—

Mr. A. J. Wenke's Estimate.

	£	s.	d.
Ploughing	0	6	0
2 harrowings at 1s. 3d.	0	2	6
Drilling	0	2	6
Manure	0	2	6
Graded seed wheat—60 lb.	0	4	6
Pickling, carting to paddock, &c.	0	0	3
Fallow land, extra scarifying	0	5	0
Harvesting	0	6	6
6 bags, 9d. per bag	0	4	6
Sewing bags and twine	0	0	9
Carting 6 bags 6 miles	0	3	0
	£1	18	0

Mr. E. S. Noske's Estimate.

	£	s.	d.
Ploughing	0	6	6
2 harrowings at 1s. 3d.	0	2	6
2 scarifyings at 2s. 3d.	0	4	6
Graded seed wheat and pickling, 50 lb.	0	4	6
Manure, 56 lb.	0	2	9
Drilling	0	2	2
Harvesting	0	6	0
Bag-sewing and twine	0	1	0
Carting 6 bags 6 miles	0	3	0
6 cornsacks at 9s. per dozen	0	4	6
	£1	17	5

Woonona.

A meeting was held on 8th May, which was attended by thirty-five members. Eight new members were elected.

Mr. S. Gahan read a paper on the handling of young fruit trees from the nursery to the orchard, dealing with planting, pruning (with a practical demonstration), and some of the diseases to which young trees are liable. Mr. Gahan also referred to the selection, cutting, planting and cultivation of the potato.

A general discussion also took place upon the arrangements for the first annual exhibition of produce, which the branch organised for the early part of June. A copy of the schedule of prizes has been received by the Department. It shows that classes had been provided for poultry, pigeons, vegetables, fruit and flowers, and for an exhibit from school children of the district.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	A. J. Alcock, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Bay Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	———
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
French's Forest	J. W. West, French's Forest.
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne	Sylvester Kennedy, Jindabyne.
Katoomba	W. E. Parry, Victoria Road, Katoomba.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Lankey's Creek (Jingellic).	———
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 581, Leeton.
Lidcombe	A. E. J. Anderson, B.A., Platform-street, Lidcombe.

Branch.	Hon. Sec.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	J. Barkell, Meadow Flat, via Rydal.
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	C. P. James, The Warren, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, Wyalong W.
Spencer	H. J. Woodbury, Spencer.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Toronto	J. Froome, Knowle Farm, Toronto,
Ulan	P.S.D. Howarth, Ulan, near Mudgee
United Peel Riv. (Woolomin).	———
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wetherill Park	L. Rainbow, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	A. Cavill, Campbell-st., Woonona.
Wyan	———
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yass	———
Yetholme	———
Yurrunga and Avoca.	R. Waples, Yurrunga.

Orchard Notes.

JUNE.

W. J. ALLEN.

Laying Out the Orchard.

Retaining Drains.—If the site is a fairly steep slope and there is any danger of washaways of surface soil, the first consideration should be the location of surface drains to prevent such washes. On our lighter soils overlying friable subsoils this is generally done by contour surface drains running across the main slope at a light grade, not greater than 1 in 40. The grade should be kept as even as possible, for if the drain changes from a steeper to a more level grade, the water is liable during heavy rain to overflow at the change of grades and cause more damage than if no drain had been constructed. These friable subsoils erode very quickly from the action of running water, hence the care necessary to construct surface drains with a light grade; otherwise very soon a deep creek will be formed which will slowly creep up the hill, cave in on the sides, and endanger great slices of the orchard. For this reason also in such country these drains are continued well out from the boundaries of the orchard, so that the waters at their outlets can spread out on to a wide space of land which should be well grassed or have some timber or light undergrowth on it to prevent washing, and on no account should have its surface disturbed in any way. To maintain an even grade these drains will twist and turn more or less, according to the unevenness of the surface of the general slope, so that the rows of trees will often not run parallel to them, but will cross them at places. For this reason the drains should be cut wide and shallow and the bank on the lower side also wide with an easy batter, in order that horse implements may be able to cross without difficulty. The frequency of such drains will vary according to the general slope, the number increasing as the slope becomes steeper. Where stiff clay subsoils exist fairly close to the surface there is not the same risk of surface drains wearing into deep creeks even when constructed with fairly steep grades, and it is often the practice in such country to form main surface drains along the bottom of the deeper depressions running up the main slope; then drains running across the main slope are led into these from either side at an easy grade. Under such a system the cross drains are shorter and can often be kept straight and parallel with the rows one way, and thus need not be crossed in cultivating operations. The system also gives great facilities for outlets to temporary open furrows, which are often left during summer when the soil is loose from cultivation and heavy downpours from thunderstorms are expected. A surface drain along the higher boundaries should also be provided to prevent the water from the slope above the orchard causing damage. Surface drains under either system that are solely for the prevention of washaways of soil should be formed as soon as the ground is cleared and ploughed. Too often this work is put off to some future date, with the consequence that heavy rains occur and irreparable damage is caused by washaways before the drains are constructed.

Headlands.—Headlands of at least 30 feet should be allowed between the fence and the first row of fruit trees to allow the easy turning of horse teams. Where land is very scarce and valuable this distance is often reduced, but one must then put up with an awkward turn and loss of time when working horse implements.

If a breakwind is to be planted it should be at least 66 feet away from the first row of fruit trees. Where possible, a wide belt of natural timber should be left for this purpose.

In some of our coastal districts where citrus fruits are grown and soiling is resorted to, wide headlands are not only left around the boundary of the orchard, but an extra width of 10 feet or more is left along the surface-retaining drains. This divides the orchard into rather small blocks, and later the headlands bordering each block provide soil within easy carting distance for re-soiling.

On slopes that will wash easily it is often the practice only to plough or cultivate across the hill, and not up and down. For this reason great care should be taken in setting the direction of the rows. The direction they take should be such that it will give sufficient fall or grade to allow water which might collect in any depression to be carried away in the plough or cultivator furrows to a surface drain. If the fall of the line of trees is too slight, then the water will not carry through these depressions but collect in them, and at last overflow and wash quantities of loose soil down the hill. In some places it is impossible to avoid the water collecting in some of the greater depressions, and in such cases washaways will have to be prevented by securely fastening logs or stones across the depressions in line with the trees where they will be least in the way of cultivation, and allow the water to escape down the hill in its natural course until it meets a surface drain. Where the subsoil is such as permits of surface drains running down the hill in the lower depressions the rows on one side of the drain might often be set at a different angle to those on the other side, in order to get the correct grade of the line of trees; but this change in direction need not prevent working right through with the plough or cultivator, provided the end trees along the drain coincide and the drain is so constructed as to allow implements to cross same.

Distance of Planting.

The distance apart at which the trees should be planted is to some extent governed by the rainfall of the locality. Greater distance must be given in districts with a low rainfall in order to allow a greater area for each tree from which to draw its supply of moisture. In rich soil where trees will grow to a great size, more room must also be given them, notwithstanding that the rainfall might be ample.

The following are the usual distances at which trees are planted on the square and hexagonal systems :—

Distance apart.	Trees per acre.	
	Square System.	Hexagonal System.
20 feet	108	125
21 „	99	114
22 „	90	103
23 „	82	94
24 „	75	86
25 „	70	80

Following are the distances at which vines are usually planted, and the number of same per acre :—

Distance apart.		No. of Vines.
6 feet x 6 feet	...	1,210
6 „ x 8 „	...	907
6 „ x 10 „	...	726
8 „ x 8 „	...	680
8 „ x 10 „	...	544
10 „ x 10 „	...	435
10 „ x 12 „	...	363

In order to arrive at the number of trees or plants required to plant an acre of land the following method is adopted :—

> Reduce 1 acre to square feet = 43,560 square feet; divide this by the square of the distance apart at which the trees or plants are to be planted.

The above gives the number of trees or plants per acre on the square system. Fifteen per cent. is added to this when planting on the hexagonal system.

In inland districts where irrigation is practised, vines are usually planted at a distance of from 8 feet x 8 feet to 10 feet x 10 feet. In the inland districts where irrigation is not practised, the distance is from 10 feet x 10 feet to 10 feet x 12 feet. In the coastal districts a greater distance is now generally given between the vines than was formerly the case; 6 feet x 6 feet to 6 feet x 8 feet for staked vines, and 6 feet x 8 feet to 6 feet x 10 feet for trellised vines being the usual distance of planting. When the vines are to be trellised the greater distance should be allowed between the rows, as this is more convenient for working and also saves material and labour in erecting the trellis.

Planting.

If the soil is in good moist condition, the present month is a good time for planting deciduous trees and grape vines. Planting, however, should not be attempted if the soil is very wet, especially in heavy soils, or if the soil is in a very dry condition. Before planting the trees all damaged roots should be cut back to sound tissue. When carrying the trees to the places at which they are to be planted, the roots should be kept covered with a damp bag so that they will not become dried by the sun or wind. The centre of the hole should be kept high, which facilitates the spreading of the roots and gives them a downward tendency. In filling use moist fine surface soil which will work in around the roots; this should be well pressed down with the foot so that it may come in close contact with the roots.

When all the trees are planted they should be cut well back, starting the head or crown of the tree from 15 to 18 inches from the ground. A great proportion of the roots which have supported the top of the tree the previous season in the nursery has been lost in transplanting; moreover, what are left take some time to become established, and consequently the tree will start far more vigorously if cut back heavily at planting, and generally will outgrow a tree which is not so treated.

Pruning.

The pruning of deciduous trees should be continued this month, dealing first with those which start out first in the spring, such as apricots, Japanese plums, and peaches, leaving pears and apples till last. Whilst pruning keep a sharp look-out for scale or other pests, and mark such trees, also any weak trees, for special treatment.

A fifth edition of the booklet on "Pruning" has just been published, and is obtainable from the Government Printer, Phillip-street, Sydney, at a cost of 1s. 1d. post free.

Fruit Fly.

Besides keeping all fallen fruit picked up and burned, if fruit fly is showing at all in the early oranges or mandarins, kerosene traps should be kept in use for the purpose of reducing this pest.

Harvesting.

Oranges are colouring earlier than usual in some districts, and where trees are carrying heavy crops, and prices will warrant it, it is a good plan to make pickings of the best coloured and largest fruit. This lessens the strain on heavily laden trees, and also lightens the work later on when picking and marketing is in full swing.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 21, 22, 23
Parkes P., A., and H. Association	G. N. Seaborn	,, 22, 23
Corowa P., A., and H. Society	J. D. Fraser	,, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 4, 5
Albury and Border P., A., and H. Society	W. J. Johnson	,, 4, 5, 6
Manildra P. and A. Association	A. Anderson	Abandoned.
Gilgandra P. and A. Association	G. Christie	Sept. 5, 6
Ganmain A. and P. Association	T. S. Henderson	,, 11, 12
Young P. and A. Association	T. A. Tester	,, 11, 12, 13
Lockhart A. and P. Society	E. D. Arnold	,, 12, 13
Cowra P., A., and H. Association	E. W. Warren	,, 18, 19
Narrandera P. and A. Association	H. S. Robinson	,, 18, 19
Temora P., A., H., and I. Association	A. D. Ness	,, 18, 19, 20
Holbrook P., A., and H. Society	J. S. Stewart	,, 19, 20
Canowindra P., A., and H. Association	G. Newman	,, 25, 26
Murrumburrah P., A., and I. Association	J. A. Foley	,, 25, 26
Henty P. and A. Society	H. L. Yates	,, 25, 26, 27
Yass P. and A. Association	E. A. Hickey	,, 26, 27
Junee P., A., and I. Association	T. C. Humphreys	Oct. 2, 3
Ardlethan P. and A. Society	W. J. Nixon	,, 3
Deniliquin P. and A. Society	L. Harrison	,, 3
Hay P. and A. Association	G. S. Camden	,, 9, 10
Tweed River A. Society	T. M. Kennedy	Nov. 7, 8

1918.

Albion Park A., H., and I. Association	J. Caldwell	Feb. 6, 7
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 26, 27, 28
Tenterfield P., A., and M. Society	R. G. White	Mar. 5, 6, 7
Tumut A. and P. Association	T. E. Wilkinson	,, 6, 7
Glen Innes & Central New England P. & A. Assoc'n	G. A. Priest	,, 12, 13, 14
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 13, 14
Cooma P. and A. Association	C. J. Walmsley	,, 20, 21
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 20, 21, 22

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VOL. XXVIII. PART 7. JULY 2. 1917.

Agricultural Gazette of New South Wales.

Elephant or Napier's Fodder Grass.

(*Pennisetum purpureum.*)

E. BREAKWELL, B.A., B.Sc., Agrostologist.

REFERENCE was made to this grass in the *Agricultural Gazette* for October, 1916, since which time it has been planted at all the experiment farms, with the exception of Wagga and Glen Innes. On the tablelands and in the interior it was planted in the spring of 1916, but up to date has not made sufficient growth to justify it being recommended for these parts.

On the coast, however, it has more than fulfilled expectations. At Grafton Experiment Farm in November, 1916, roots and cuttings were planted 6 feet apart over an area covering one-tenth of an acre. Some plants grew 12 feet high in four months, and had as many as forty stems to a stool, and when cut it yielded at the rate of 16 tons of green fodder to the acre. At Wollongbar Experiment Farm a slightly smaller area was planted on the same date. The grass made even better growth than at Grafton. When cut it yielded at the rate of 25 tons of green fodder to the acre. For four months' growth this must be considered somewhat remarkable.

At Hawkesbury Agricultural College the weights have not yet been ascertained, but there is no doubt the grass is admirably adapted for this district also.

Feeding tests were carried out at the College and at Wollongbar and Grafton Experiment Farms. At the College the grass was fed in the rough, and also as green chaff, to stall-fed Jersey cows. In the rough the cows ate the young leaves, but neglected the coarse growth. In every instance, however, the chaff was eaten up readily. At Grafton Experiment Farm a similar experiment was carried out with Ayrshires, and again with very satisfactory results. At Wollongbar Experiment Farm Guernsey cows also ate the grass and chaff readily. These three tests are sufficient to demonstrate the palatability of the grass.

Chemical Analysis.

The official analysis of the grass by Mr. F. B. Guthrie, Chemist, is as follows :—

	per cent.		per cent.
Moisture ...	... 65·84	Carbohydrates ...	... 14·13
Albuminoids	... 3·58	Ash	... 2·68
Ether extract	... ·53		
Fibre ...	... 13·24		100·00

Albuminoid ratio, 1 to 4·3. Nutritive value, 18·90.

This compares very favourably with any other grass hitherto analysed, with the exception that the proportion of fibre is larger than in some grasses.

Experience in Africa.

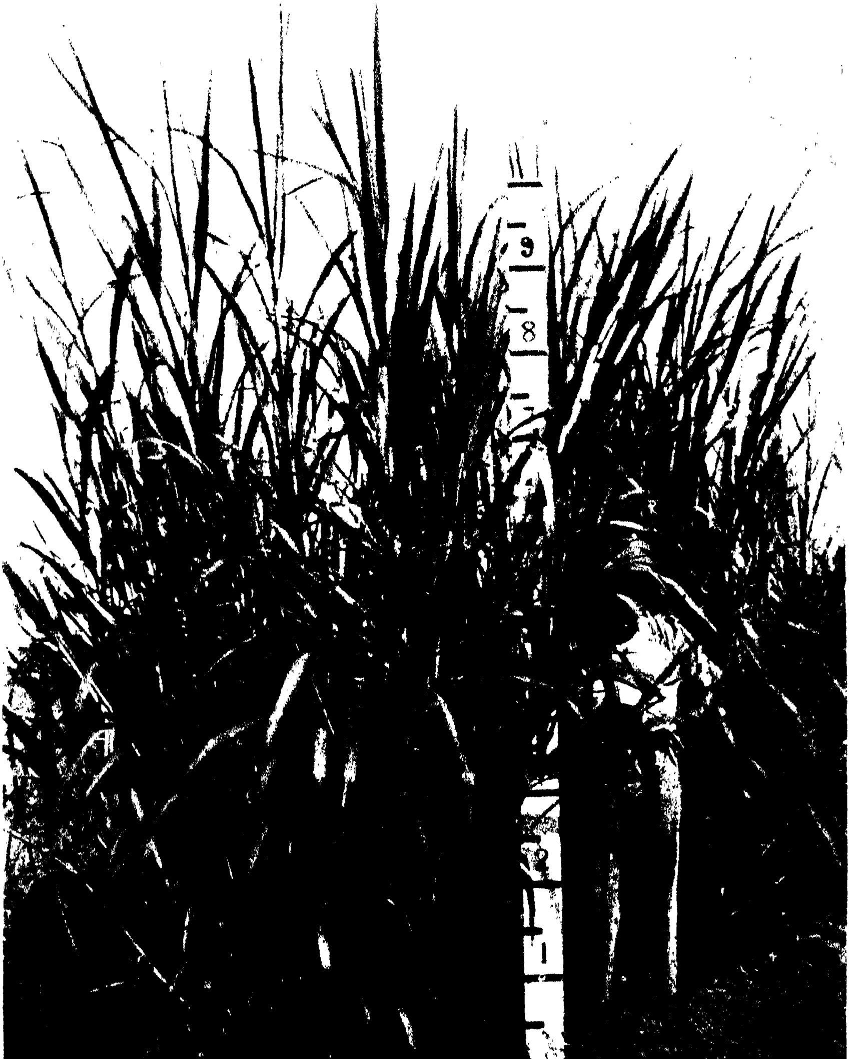
The following information is culled from the *Kew Bulletin*, 1912 :—

> This grass extends from Sierra Leone to Rhodesia, as far east as Beira. It occurs along watercourses and in marshy depressions, but also enters the bush and forest where open spaces afford sufficient light. Under favourable conditions it forms extensive reed jungles, as, *e.g.*, in the delta of the Zambesi. In rich marshland it attains a height of 21 feet, while on drier soil it only grows 6 feet high. The stems are utilised by the natives for making fences.

Elephant Grass at Wollongbar Experiment Farm.

Yielded 25 tons of Green Fodder per acre after four months' growth.

Like Pearl Millet, it is reported to be an extremely good drought-resister. Both cattle and horses eat it readily. Like sugar cane, it may be propagated either by subdivision of roots, or from cuttings or slips. It roots freely and is reported to grow rapidly after each cutting, thereby enhancing its value as a soiling crop.



Growth at Hawkesbury Agricultural College.

ELEPHANT OR NAPIER'S FODDER GRASS.

The following comparative chemical analysis with sugar cane fodder, which also grows on the northern rivers, made at the Botanical Experiment Station, Salisbury, is interesting :—

	Sugar Cane Fodder. per cent.	Napier's Fodder. per cent.
Water	73·63	61·81
Ether	·22	·29
Protein	1·27	2·92
Carbohydrates	17·73	17·29
Woody fibre	5·32	14·77
Ash	1·83	2·92

It will be noticed that the amount of fibre in the grass is much greater than that in the cane fodder, but in protein it is superior, while in carbohydrates it is nearly equal to the cane.

The amount of juice expressed from sugar cane fodder was 56·6 per cent., while that from Napier's fodder was 21·3 per cent.

Local Experience.

It has been noticed that the grass makes the greatest growth in the summer months, and responds very readily to moisture. It appears to stand plenty of cutting, and has been permanent in the Botanic Gardens for three years. After cutting, the severed parts send out fine stems, eventually producing leaves smaller and of a finer quality than the original stock. This is the growth that is most appreciated by cattle.

While at first it appeared that it was unlikely to seed under Australian conditions, writing as recently as 1st May, 1917, the Experimentalist at Grafton Experiment Farm reported :—

> Some little time back we were asked if this grass had seeded, and the reply was, " No seed heads had yet appeared."
>
> About a fortnight ago, however, after 8½ months' growth of the first sowing, and a little less than six months of a later sowing, which almost equalled the first, the stems of both sections commenced to taper off, denoting seeding time; now the whole plot is flowering strongly. Whether the seed will set this season or not remains to be seen, but so far everything points to a fairly heavy yield.
>
> The growth and stooling have continued along satisfactory lines, and some fine sheaves were a great attraction at the recent local shows.

The grass has now been tried sufficiently for its cultivation to be recommended to farmers on the coast. A limited number of slips and rooted cuttings can be supplied from the Botanic Gardens, Sydney, and from Grafton and Wollongbar Experiment Farms. Owing to the cost of postage, packing, &c., a small charge will be made, viz., 2d. per cutting or 6d. per root.

Top-dressing Lucerne with Superphosphate.

EXPERIMENTS AT GLEN INNES FARM.

THE value of applying fertilisers to areas of established lucerne is a matter of considerable importance, and with a view to testing its utility at Glen Innes Experiment Farm, the Experiments Supervision Committee arranged a trial on lines which might easily be adopted by lucerne growers throughout the State. It must be clearly understood that the results are for one year only, and are therefore by no means conclusive, but the yields under the treatment have been so encouraging that it is felt that farmers are entitled to the earliest possible information concerning them. The experiment will be continued.

The following summary has been compiled from statements furnished by Mr. R. H. Gennys, Manager of the Farm, and Mr. G. G. St. C. Potts, H.D.A., H.D.D., who was Assistant Experimentalist at the farm for most of the time covered by the report.

The land on which the experiment is being conducted is on a slight slope, and is very even in character. The plots run up and down the slope, and thus make comparison possible. The heavy black soil of basaltic origin is about 6 inches deep, and has a stiff retentive subsoil. This in a few feet passes into a yellowish decomposed basalt, which still further down merges into the basaltic rock itself.

The paddock in which the experiment is located was laid down to Algerian lucerne in 1907, and was sown with the drill at the rate of about 9 lb. per acre. It was cut twice each year, and was fed off during the rest of the season by sheep and cattle. The land was well limed when first put under crop, and gave two fair straw crops before being sown with lucerne. About four years ago one top-dressing with superphosphate was applied at the rate of 100 lb. per acre. This improved the paddock a good deal for about a year, but after that all results from the manure apparently disappeared and the paddock went back to its normal state. The only other treatment was an occasional harrowing and cultivation.

On the 28th August, 1916, the area was cultivated crossways with the spring-tooth cultivator, and on the 1st September the plots received fertiliser through a 15-disc wheat drill with fertiliser attachment in accordance with the following plan :—

1 (*check*). No manure.
2. 1 cwt. superphosphate per acre.
3. 2 ,, ,, ,,
4 (*check*). No manure.
5. 1 cwt. superphosphate and ¼ cwt. sulphate of potash per acre.
6. 1 ,, ,, ½ ,, ,, ,,
7 (*check*). No manure.

All plots received the same treatment, and the drill was run over the unmanured plots without the fertiliser running. The plots were 1½ chains long, 27 links wide, and thus comprise $\frac{1}{25}$ of an acre each.

The cuttings of green fodder may be summarised as follows :—

Plot No.	Yield per acre.											
	1st Cutting, 15th November, 1916.				2nd Cutting, 6th January, 1917.				3rd Cutting, 16th February, 1917.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
1 (*check*) ...	1	7	0	26	1	3	2	18	1	9	3	18
2	2	13	2	8	3	0	2	24	2	5	1	7
3	3	0	1	2	4	6	0	18	3	6	2	2
4 (*check*) ..	1	6	1	10	1	11	1	0	1	6	1	10
5	2	15	1	12	4	0	1	12	3	1	0	18
6	2	19	3	8	3	13	1	21	2	19	1	14
7 (*check*) ...	1	6	3	4	1	0	0	10	1	6	0	13

The rainfall during the growing period was 2,562 points.

The following summary shows the total yield of each plot during the year, and also the percentage yield which is based upon the assumed or "natural" yield of the plot if treated in the same way as the check plots:—

Plot No.	Fertiliser.	Total Yield of Green Fodder.				Percentage.
		t.	c.	q.	lb.	
1 (*check*) ...	No manure	4	0	3	6	100·
2	1 cwt. superphosphate	7	19	2	11	195·
3	2 ,, ,, ...	10	12	3	22	256·9
4 (*check*) ...	No manure	4	3	3	20	100·
5	1 cwt. superphosphate and ¼ cwt. sulphate of potash	9	16	3	14	245·2
6	1 cwt. superphosphate and ½ cwt. sulphate of potash	9	12	2	15	251·4
7 (*check*) ...	No manure	3	12	3	27	100·

At the present time, when sulphate of potash is practically unobtainable, it is difficult to assess the financial results attending its application, but the figures with regard to superphosphate are certainly illuminating.

	1 cwt. Superphosphate per acre.				2 cwt. Superphosphate. per acre.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Total yield of green fodder per acre	7	19	2	11	10	12	3	22
"Natural" yield of same plot...	4	1	3	11	4	2	3	15
Difference due to manure	3	17	3	0	6	10	0	7
	£	s.	d.		£	s.	d.	
Value of difference at 15s. per ton of green fodder ...	2	18	4		4	17	6	
Cost of manure at 5s. per cwt.	0	5	0		0	10	0	
Profit from use of manure	2	13	4		4	7	6	

It was intended to make a fourth cutting and to convert a small quantity into hay, but a severe frost affected the plots so irregularly that a fair comparison could not be made. Much of the leaf, and in some patches all of the leaves, were quite destroyed, and it was nearly hay when cut. The Manager, however, reports that even in this fourth cutting the difference between the manured and unmanured plots was more marked than ever.

Dry Rot in Timber.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

IN temperate climates with a humid atmosphere fungi are frequently to be found growing upon the woodwork or floors of buildings. Some of these are mere moulds, feeding feebly and slowly upon the surface of the wood; others cause deep-seated rotting and the eventual destruction of the wood fabric, and are known as "dry rot" fungi. In countries with hot dry climates, the destruction of timber in buildings is not so likely to occur as in those with a humid atmosphere. In New South Wales various climates are found, and "dry rot" of timber not infrequently occurs. The following notes, therefore, derived mainly from an article by Prof. P. Groom,* may be not without interest, more especially as to the means of dealing with "dry rot" when it is detected.

Practical men distinguish between "dry rot" and "wet rot." Generally they describe as "wet rot" such decay as is started in the standing tree or is already present in the unconverted log. As the fungi causing this form of rot chiefly attack the standing tree, they are known as parasites, even although in reality they often attack only the dead wood of such trees. By "dry rot" practical men mean the form of decay induced in timber that is apparently sound when first used as constructional material. Inasmuch as fungi commonly causing dry rot are largely not parasitic on trees, this popular distinction between "dry rot" and "wet rot" is partly justified.

The Characters of some Dry Rot Fungi.

The fungi causing dry rot in different structures (houses, mines, railway sleepers, &c.) in various regions of the world are by no means identical. The fungus *Merulius lacrymans*, the most malignant and wide-spread species occurring in the houses of temperate lands, is said to be absent in the tropics; this is borne out by experiments which show that moderately high temperatures stop the growth of this fungus. Two other important types are frequently found associated with *Merulius lacrymans*. They are *Coniophora cerebella* and *Polyporus vaporarius*.

Until recently investigators failed to cause the very common spores of *Merulius* to germinate upon and infect wood. It has now been proved, however, that the spores germinate freely and infect wood previously attacked by other wood-destroying fungi, including *Coniophora*. The incidental co-operation between these two species goes further, and has important practical bearings. *Coniophora* demands for its growth in wood a large supply of moisture; hence, if wood is protected against excess of moisture, it is directly guarded against the attacks of this fungus, and indirectly against those of *Merulius*. *Merulius*, on the other hand, once established can manufacture water and thereby moisten and attack the driest wood, and incidentally render the latter open to the attack of *Coniophora*. "In all cases of dry rot examined by me," says Prof. Groom, "I have never found an instance in which less than two kinds of fungi were engaged." *Merulius* having once gained entrance to the wood, exhibits two different forms of active growth: on the one hand it sends into the wood numerous fine threads, which feed upon the wood and so destroy the whole fabric, and on the other hand, it gives forth numerous threads which run over the surface of the wood, weaving themselves into cord-like strands or thin skin-like sheets. This superficial mode of development is important, for it enables certain fungi causing the worst forms of dry rot to spread rapidly. By means of these superficial threads *Merulius* can advance far over innutritious substances such as brick walls and bell wires. Thus infection is transmitted to distant woodwork.

---

* Dry Rot. Professor P. Groom, M.A., D.Sc., *Journal of the Board of Agriculture*. Vol. xxiii, No. 5, p. 465.

Merulius when it has once gained a footing can grow on the driest wood. It owes this remarkable faculty to its power of producing wate , which is to be seen on the tips of its threads when exposed. The specific name *M. lacrymans* refers to this phenomenon, for *lacrymans* means weeping. This water is not first taken in by the fungus and subsequently pumped out, but is actually the result of specialised chemical activity. The fungus converts portions of its main food material, viz., wood, into carbon dioxide and water, just as do the larvæ of certain beetles that tunnel in dry wood.

Conditions Favourable to Dry Rot Fungi.

Wood-destroying fungi demand appropriate supplies of water and oxygen; such fungi cannot grow inside wood except when it contains moisture within certain limits. Hence the use of sapwood or of wood that has been improperly seasoned is a predisposing cause of the development of dry rot.

Lack of proper ventilation, however, is one of the conditions most favourable to the development of the disease. Wood exposed in ill-ventilated cellars will be frequently found to have a film of moisture on its surface. In the absence of air currents successive condensations keep the timber constantly damp, and it readily becomes a prey to dry rot fungi. *Coniophora*, unlike *Merulius*, must have moisture. It is found so frequently upon moist wood in damp cellars that it is known as the "cellar fungus."

Measures of Control.

From what has been said above it follows that proper ventilation is of paramount importance in preventing dry rot. In cellars and mines this may not always be possible, but in buildings above ground it should be the first consideration.

Original infection must generally be traced to lack of proper sanitation where timber is stored, or to carelessness in allowing the diffusion of infection from material removed from buildings. Rotten or decayed wood of any kind should not be allowed in timber yards, and diseased wood removed from buildings should be immediately burnt. The antiseptic treatment of wood gives a certain amount of security, but absolute protection can only be secured by thoroughly impregnating the timber with an antiseptic, a very difficult and costly procedure. Coatings of a suitable antiseptic, however, greatly decrease the chances of infection of sound wood. No antiseptic is yet known which is perfectly satisfactory in the case of dwelling houses. As a means of guarding against *Merulius lacrymans*, the following substances often recommended may be dismissed—copper sulphate, iron salts, zinc chloride, and mercuric chloride. Creosote and tar are effective, but their odour and colour restrict their use. Boric acid and magnesium fluosilicate are strongly recommended. Wood-preserving oil, prepared from kerosene shale, is effective if the ventilation is good. When the presence of dry rot is suspected, and particularly if fungi make their appearance, specimens of the wood should be submitted for examination, as the nature of the treatment will depend in great measure upon the particular fungi present.

Where the presence of a serious attack of dry rot has been established, not only must the infected wood be removed, but the adjoining woodwork, though showing no external signs of decay, must also be removed. Mr. A. Brooks, Works Overseer of the Department of Agriculture, has called my attention to the fact that if dry rot makes its appearance in the joists of a floor it is especially necessary to remove the ends touching the wall and the bearer supporting the joists, for it is particularly between the woodwork and the wall that the fungus resides, and from which area fresh infection starts. It is therefore essential that such woodwork should be removed as is necessary to enable this area to be thoroughly disinfected. When the wood has been removed, all surfaces of brick or stonework freshly exposed by the removal should be disinfected by the application of a blast flame from a plumber's blow lamp. The cut ends of the wood and all adjacent woodwork should be dressed with dilute formalin, and as this antiseptic evaporates, more than one dressing should be applied.

Effect of Heat and Cold upon Fungus Growth.

The effect of temperature may appropriately be considered here.

Merulius lacrymans and *Polyporus vaporarius* both thrive best at moderate temperatures; according to R. Falck the highest temperature at which the normal form of the latter will grow is between 26 and 27 degrees Cent. The mycelia of both species are rapidly killed by exposure to a temperature of 40 degrees Cent. Spores and the fungi themselves are rapidly killed by steam. The resistance to low temperatures is greater, for *Merulius* can endure a temperature of 0 degree Cent.

If we compare these fungi with others found as saprophytes or parasites upon fruits, we find that their temperature relations are very similar. Thus *Monilia* and *Penicillium* germinate at 0 degree Cent., but growth is very slow; others do not develop below 5 degrees Cent., but if growth is started at a higher temperature, it can continue at this temperature. The optimum temperature of growth for *Monilia* and *Penicillium* is 25 degrees Cent.; for *Thielaviopsis*, *Glomerella*, and *Cephalothecium*, 30 degrees Cent.; and for *Rhizopus* 36 degrees Cent. The thermal death point of *Rhizopus* is 60 degrees Cent.; of *Penicillium* 58 degrees Cent.; and of the remaining fungi between 51 and 53 degrees Cent.*

Removal of Decaying Wood from Timber Yards.

While this article has been devoted to the consideration of dry rot in buildings, it remains to be pointed out that rotting may originate in the timber yard, and therefore the careful inspection of stored timber and the removal of any showing signs of decay is necessary. One example will suffice. As a rule a line can be drawn between the fungi ordinarily growing on the wood of coniferous or of deciduous trees, but when the usual host is absent another of an entirely different nature is frequently selected. Thus the fungus *Lenzites sepiaria,* which most frequently attacks growing pine timber (giving rise to dry rot later), has been recorded upon thirteen different species of trees not belonging to the Coniferæ. Moreover, though generally confining its attack to soft wood, it is occasionally found destroying the heart wood of living trees, entering through wounds and following close behind the newly formed sapwood.

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* Adeline Ames. Temperature relations of some fungi causing storage rots. *Phytopathology,* vol. 5, No. 1, p. 11.

AGRICULTURAL LENDING LIBRARY.

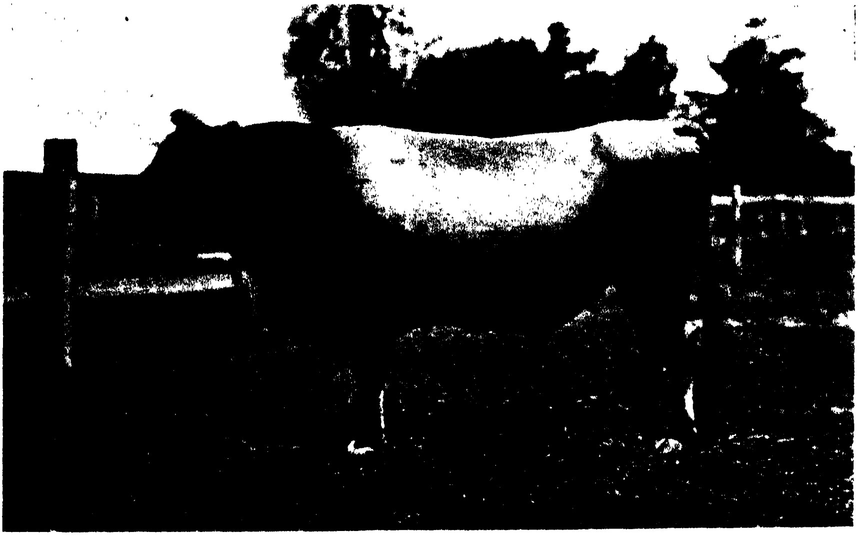
THE Principal Librarian of the Public Library of New South Wales desires that attention should be drawn to the Country Reference Section, in which parcels of from one to three reference works are lent for one month from date of issue (unless an extension of time be applied for and granted). These books are forwarded by post only, and are lent free of all charge, excepting the return postage, which must be paid by the borrowers.

The section includes a large number of valuable works on agricultural and allied subjects, such as bee culture, fruit growing, poultry farming, dairy farming, horse breeding, sheep raising, veterinary science, &c., and readers of the *Gazette* who desire to supplement their knowledge in this direction are invited to get into communication with the Public Library and obtain further details of the scheme.

Jerseys at Cowra Experiment Farm.

M. H. REYNOLDS, Manager.

THIS herd was established in April, 1912, by the purchase at the Sydney Royal Show of that year of four heifers, including Lady Colleen II (2,164, A.J.H.B.), bred by Mr. Higinbotham, of Armidale, and Trenton's Lily, a cow descended from the Lady Trenton blood maintained for years in the Coolangatta and Retford Park studs. The Wagga Experiment Farm was also drawn upon in July, 1913, for foundation females, representatives of some of the best families being procured. Further additions were made when the Wollongbar Farm stud was rearranged in October, 1913. Selected cows of Wagga breeding were obtained, including the extra good cow Wagga Adeline (1,462, A.J.H.B.). The most recent additions have been five selected heifers from Yanco Experiment Farm in December, 1916. These were sired by Bridegroom and Grenadin (imp.). From the Hawkesbury Agricultural College in December, 1916, came two young cows and the present head of the stud, Xmas Fox (imp.). This bull was bred by the noted English breeder, Mr. J. H. Smith-Barry, Pewsey. He is by Silver Fox (10,097, E.H.B.) from Malvoisie, by Gay Boy (7,510, E.H.B.) from Madeira 7th, by Reminder's Invention (7,643, E.H.B.) from Madeira 6th, by Alfriston Duke (5,452, E.H.B.) from Madeira 5th, which was imported to Victoria by Mr. G. T. Chirnside, of Werribee Park. Xmas Fox is thus



Xmas Fox (imp.).

By Silver Fox (10,097 E.H.B.), ex Malvoisie.

related to that good producing cow Madeira 8th (1,174), who is a granddaughter of Madeira 5th (imp.), her record being 8,348 lb. milk and 616 lb. butter in 365 days. Several heifers by this bull have lately come into profit and are very promising, viz.:—

Culcairn II, 2 years old, yielded 3,807 lb. milk, 5·72 per cent. test, and 246·81 lb. butter, in 273 days.

Comfort, 2 years old, yielded 3,880 lb. milk and 225·27 lb. butter in 273 days.

Rum Omelette IV, 2 years old, yielded 3,328 lb. milk and 228 lb. butter in 243 days.

Bluebell, 2 years old, yielded 4,522 lb. milk and 253·68 lb. butter in 273 days.

Lady Colleen III.

By Kaid of Khartoum ex Lady Colleen II.

Milk yield, 3,514 lb. milk and 215·61 lb. butter in 273 days as a 2-year old.

Glory Quayle (illustrated) yielded 5,458 lb. milk and 302·28 lb. butter in seven months on her first calf, and is still milking.

Other sires used in the herd included Kaid of Khartoum, by Sir Jack (188), (sold by the Department at Sydney Show sales for 175 guineas), from Egyptian Belle (382, A.J.H.B.). Kaid of Khartoum is the sire of Lady Colleen III (illustrated) and Lady Trenton of Cowra, two promising young cows.

Shakespeare, by Sir Pat from Leading Lady, is another of the sires that has been used at this stud.

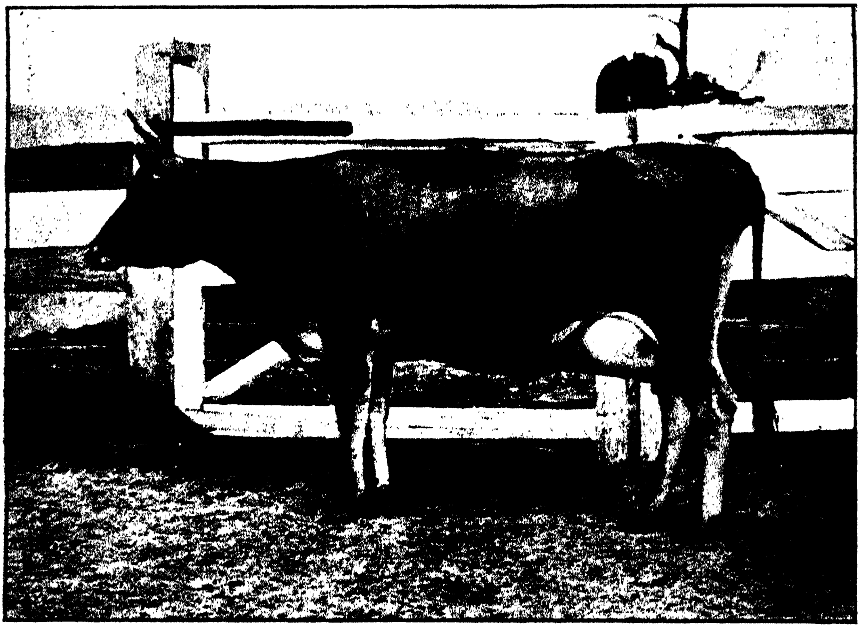
Grenadin (imp.) is by Attorney (9,947, E.H.B.) from Cyril's Carnation, by Cyril (8,144, J.H.B.) from Carnation's Pearly (10,397, P.S.H.C.).

Trafalgar is by Best Man (220, A.J.H.B.) from Rum Omelette (imp.), (210, A.J.H.B.), who yielded off grass pastures 6,077 lb. milk and 332 lb. butter in 238 days—a cow of excellent type, as well as production. Young heifers by this bull are showing great promise.

Two Groups of Stud Cows.

JERSEYS AT COWRA EXPERIMENT FARM.

Lady Colleen II (2,164), the Armidale-bred cow, is by Golden Pride, a son of the noted Cherry Pride (imp.) (375, A.J.H.B.), ex Golden Columbus by Columbus (imp.); dam Lady Colleen (188, A.J.H.B.) by Golden Lord (imp. in dam) (39, A.J.H.B.) Her milk yield for 365 days was 5,144 lb. milk, 5·72 per cent. test, 340·50 lb. butter. Her daughter, Lady Colleen III, by Kaid of Khartoum (illustrated), as a 2-year-old yielded 3,514 lb. milk, testing 5·25 per cent., equal to 215·61 lb. butter, in 273 days.



Glory Quayle.

By Xmas Fox (imp.) ex Egypt's Glory (383 A.J.H.B.), by Sir Jack (188 A.J.H.B.).

Yield for seven months, 5,458 lb. milk and 302·28 lb. butter on her first calf, and is still milking.

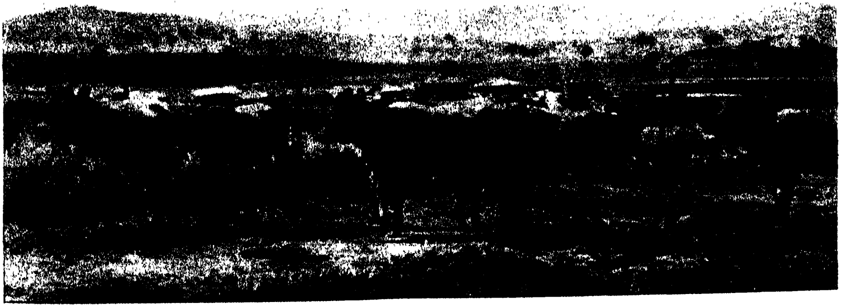
Wagga Dora (1,470, A.J.H.B.), one of the Wagga-bred cows, is by Golden Lord (imp. in dam) (39), by Golden King (imp.) (37 A.J.H.B.) ex Colleen (imp.) (40, A.J.H.B.), both imported by the Department; dam, Wagga Doreen by Colleen's Golden Lad (119, A.J.H.B.) from Wagga Dot, by Coral's Lad, by Mabel's Prince (imp.) ex Coral (imp.), both foundation stock in the noted Coolangatta stud. Wagga Dora's milk yield in 273 days was 6,063 lb., testing 4·68 per cent., and yielding 333·08 lb. butter.

Wagga Seaspray (1,369, A.J.H.B.) is by Golden Lord (imp. in dam) (39) from Seaweed, by Colleen's Golden Lad (119) from Pansy, by Coral's Lad. Her milk yield was 5,775 lb., testing 4·83 per cent., equal to 328·38 lb. butter, in 273 days.

Wagga Mary Ellen is by Coral's Lad from Wagga Ellen (784, A.J.H.B.), by Colleen's Golden Lad (119) from Wagga Flirt, by Coral's Lad from Wagga Nancy, by Newman from Lily, a foundation cow of the Wagga herd,

Trenton's Lily and Lady Colleen III.
Both of good dairy type.

Wagga Niewong.
A robust cow, with a good udder.



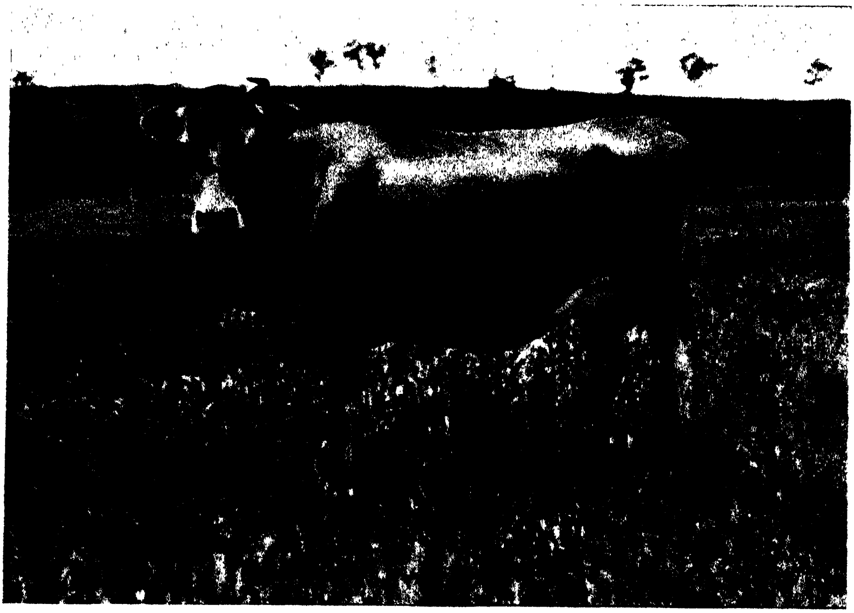
Group of Stud Heifers by Grenadin and Trafalgar.

JERSEYS AT COWRA EXPERIMENT FARM.

who traces back to Pink, born in 1878, and a prize-winner at the first Melbourne Show. Wagga Mary Ellen's milk yield was 4,840 lb., testing 5·0 per cent., equal to 312·5 lb. butter, in 273 days (incomplete).

Another cow of this strain is Wagga Lydia (1,477, A.J.H.B.), by Golden Lord (imp. in dam) (39, A.J.H.B.) from Wagga Ellen (784, A.J.H.B.). She is a cow of good type and production, her record being:—milk yield, 5,734 lb., 5·1 per cent. test, 341·69 lb. butter, in 273 days.

Wagga Adeline (1,463, A.J.H.B.), by Golden Lord (imp. in dam) ex Wagga Judy, by Coral's Lad from Wagga Marjorie, is an exceptionally fine dairy cow, and a good producer. In 273 days she yielded 5,711 lb. milk, testing 4·9 per cent., and giving 327·34 lb. butter; also in 243 days (incomplete) she gave 5,994 lb. milk, testing 5·21 per cent., and giving 379·68 lb. butter.

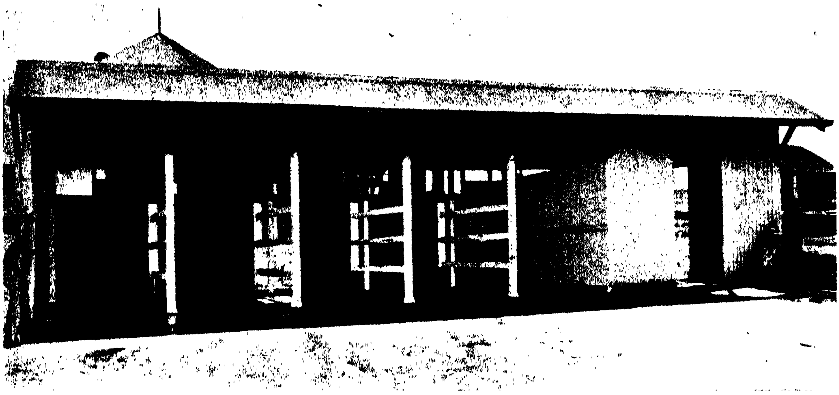


Trenton's Lily.

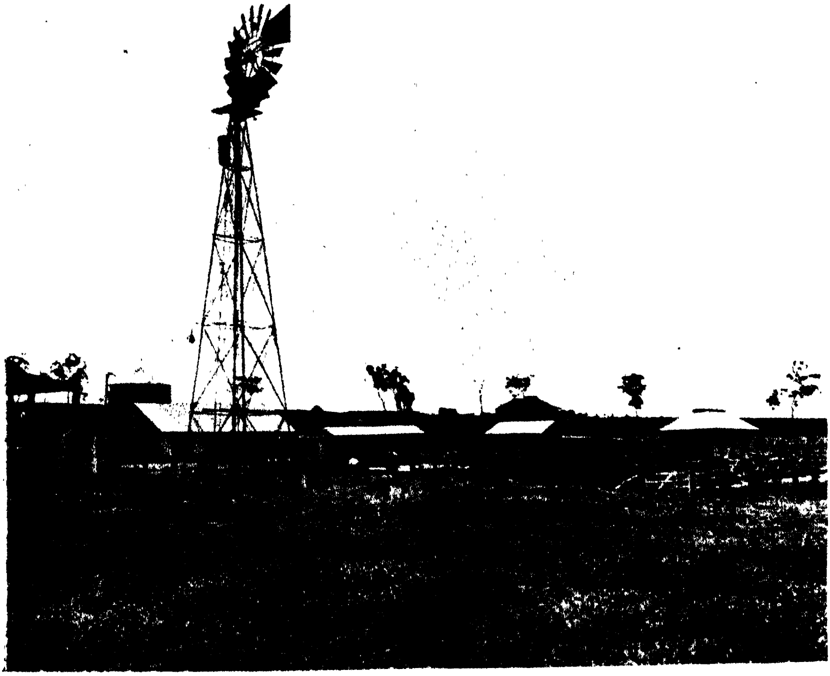
Yield, 5,050 lb. milk and 313·76 lb. butter in 273 days.

It will be noted that the herd is strong in the blood of Golden Lord and Coral's Lad, who were worthy representatives of noted families. This blood ought to nick exceptionally well with the present sire, Xmas Fox.

Wagga Kalang is by Thessalian II (192, A.J.H.B.) by Thessalian (imp.) (76, A.J.H.B.) ex Egyptian Princess (imp.) (65, A.J.H.B.); dam, Wagga Aitua (787, A.J.H.B.), one of the matrons of the Wagga herd, by Colleen's Golden Lad (119, A.J.H.B.) from Wagga Ranee (793, A.J.H.B.), by Coral's Lad from Wagga Empress (785, A.J.H.B.). Her yield as a 3-year-old was 4,546 lb. milk, testing 5·6 per cent., and giving 299·69 lb. butter, in 273 days.



Milking Shed, Cowra Experiment Farm.



General View of Dairy Buildings, Cowra Experiment Farm.

JERSEYS AT COWRA EXPERIMENT FARM.

Trenton's Lily is by Golden Fox (142, A.J.H.B.) by Carnation's Fox (imp.) (108 A.J.H.B.); dam, Lady Trenton of Coolangatta (502, A.J.H.B.), by Busy Boy (11, A.J.H.B.), from Miss Trenton (606, A.J.H.B.), by Pomona's Daily (imp.) (65, A.J.H.B.) from Lady Trenton, by Eridge Park (409, A.J.H.B.). This was a noted family in the herd of the late Mr. Sam Hordern, Retford Park, and also that of the late Sir John Hay, Coolangatta. The yield in 273 days was 5,050 lb. milk, testing 5·26 per cent., giving 313·76 lb. butter.

Lady Trenton of Cowra is by Kaid of Khartoum ex Trenton's Lily. She is the dam of a promising bull calf by Trafalgar. Her record reads: 4,154 lb. milk, 4·75 per cent. test, and 226·71 lb. butter, in 273 days as a 2-year-old.

The Feeding and Grazing of the Jersey Herd.

The calves are started on their mother's milk, then put on whole milk, then on skim-milk and boiled whole linseed, and are finally weaned on to grass at about six months. During this period they are inspected by the Herd Master, and culled if necessary.

They are then turned on to pasture, being used, generally with other dry cattle for cleaning up cultivation and lucerne paddocks.

The milking cows are turned on pasture or fodder crops such as maize, oats, lucerne, &c., in the field, and when there is not a sufficiency to keep them on full milk, they are fed lucerne hay, maize silage, wheat cavings, and molasses.

In November, 1916, the surplus cream was sent to the Canowindra butter factory. The amount of butter manufactured by them and by ourselves for home consumption from 1st November, 1916, to 28th February, 1917, was 1,842 lb. The production of milk for this period was 3,524 gallons, of which 546 gallons were consumed whole, leaving 2,978 gallons to be separated, thus showing 6¼ lb. of butter for each 100 lb. of milk. For this period there was an average of 17½ cows milked in each month for 881 gallons of milk, averaging 1·6 gallons per cow per day. Considering that this includes milking heifers at the hottest and driest period of the year, the result is satisfactory.

Jersey cattle are not in favour at present, owing to the demand for beef and general utility breeds; hence it is necessary to destroy practically all bull calves, excepting very special ones. These are giving satisfaction.

The progeny of our Jersey herd are very promising, and the locality and conditions appear to suit the breed admirably. They are keeping robust, and yet fine in shape.

There are now at this farm forty-two head. All the cows were tested with tuberculin on arrival, and the test has been applied in certain instances since, but no tuberculosis or other contagious disease has appeared in the herd.

To handle the herd properly an up-to-date dairy and milking and feeding sheds have been provided. However, the cows have become so quiet with good handling that bailing-up, leg-roping, and such-like checks are not now used, except with heifers.

The Middle Northern Rivers.

GREAT PROGRESS IN DAIRYING.

P. G. HAMPSHIRE, Dairy Instructor.

DURING the past twelve months a very marked advancement in the production both in quantity and quality of butter and cheese has been shown in this district.

This is in evidence in every centre of this part of the North Coast, and the progress can be attributed to three main reasons.

First, the season; second, the operation of the Dairy Industry Act; and third, the pasteuriser, which became necessary owing to Dairy Industry Act standards. The bountiful season just ending, the best for a great many years, is mainly responsible for the increased production. The Dairy Industry Act and the pasteuriser have also influenced the record production, inasmuch as the Dairy Act (now that the dairy farmer is beginning to understand it thoroughly) has given many a lukewarm dairyman confidence that he will get all there is in his cream, and so has resulted in his going into the business whole-heartedly. Then again, the pasteuriser has assisted the man living a long distance from the factory, in enabling the factory to make a "keeping" butter from cream which, without pasteurisation, would only produce an inferior or non-keeping article.

Almost every factory in this district has put up a record this season. In one instance, a factory doubled its previous record for a given period.

The output of butter alone from this portion of the North Coast, from the Nambucca to the Waliamba River, for one month was approximately 500 tons. Take a district like the Nambucca River: ten years ago this centre would make, perhaps, 10 tons of butter for a month; it now produces 80 tons.

The best evidence of the progress in dairying, and of the satisfactory working of the new Act, is the great extent of building and rebuilding of factories in different centres. No less than five new butter factories are being built, all of which are in new dairying centres, namely, Taylor's Arm, a branch of the Nambucca River; Bellbrook, on the Upper Macleay River; Wauchope, Upper Hastings River: Summer Island, Lower Macleay River; and Bullahdelah, on the Myall River.

This means the opening up of new dairying land, and will thus further increase the production. There were also four new cheese factories built during the year, three of which are on the Macleay.

A new condensed milk factory is nearing completion at Smithtown, on the Macleay, and will cost about £30,000 when ready for operations. It is anticipated that a large proportion of the rich Macleay flats, which at present grow maize, will be converted into dairying land, and supply the milk factory.

Factories rebuilding include that of the Manning River Dairy Company at Mitchell's Island, where they are about to erect a fine reinforced concrete building, to cost about £8,500; while the Upper Manning Dairy Company of Taree intends rebuilding at Chatham, the railway connection with the deep water of the Manning River.

The Dairy Industry Act has been the means of great improvement in the construction of factories, and new buildings are being erected on greatly improved lines. Marked progress has been made by the introduction of the pasteuriser at the butter factories, which has advanced to such an extent that at the present moment 84 per cent. of the butter made in this district is made from pasteurised cream.

The factories which have installed pasteurisers, and which are all working with great satisfaction, are :—

Bowraville Dairy Co., Nambucca River	"Vat" or Low Temperature System.
Nambucca Dairy Co., Nambucca River	
Bacchus March Milk Co., Macleay River	
Wingham and Upper Manning Dairy Co., Manning River ...	
Manning River Dairy Co., Manning River	
Upper Wallamba Dairy Co., Wallamba River	
Macleay River Dairy Co., Macleay River...	"Flash" or High Temperature System.
Hastings District Dairy Co., Hastings River	
Upper Hastings Dairy Co., Hastings River	
Upper Manning Dairy Co., Manning River	
Bullahdelah Dairy Co., Myall River	"Flash" Regenerator System.
Upper Macleay Dairy Co., Macleay River...	

The quality of the butter manufactured has improved out of all recognition, and without question the principal factors are the Dairy Industry Act and the pasteuriser. The Act has resulted in the farmer sending in a greatly improved article, which is now properly classified by graders, certificated under the Act, and paid for according to quality; and the pasteuriser has ensured a good keeping butter, a butter which "stands up" well to the adverse transit conditions that exist from some of the North Coast rivers.

That the Act is playing a big part in the improvement of the quality of the butter, in conditions of factory management, in the improvement of factory construction, and in dairying methods generally, is in evidence daily if one is to be guided by the public utterances of factory directors and managers, and those interested.

From the Instructor's point of view the situation at present is most marked, particularly in regard to the improvement in the quality of the cream supplied and the further improvement. Prior to the Act coming into force up to 50 per cent. of the cream received at the factories on some rivers was of inferior quality, a large proportion of which was of extremely low grade, and the instructor's efforts to convince the farmer as to the error of his ways was made abortive when he (the Instructor) was shown the factory statement, which proved that top price was paid for all his cream. Now the farmer becomes his own inspector—the weekly returns received from the factory shows how his cream is arriving, and if inferior grades are showing he immediately sets about putting his house in order, and invariably is soon able to locate the cause of the inferior cream.

Taking everything into consideration, everything points to a very progressive future in dairying to the Middle North Coast of New South Wales.

Official Milk and Butter Records.

M. A. O'CALLAGHAN.

THIS month a long list of records is published, including those of a number of Darbalara cattle and also of cattle from the different Government Experiment Farms.

Mr. C. R. G. McDonald, of Ingleburn, carries the Jersey flag to the front with his fine cow Exile's Brighton Queen. She gave 12,142 lb. of milk, which produced 752 lb. of butter. This is a record that will take some beating for a cow that was only 3½ years old when she started her test, especially when it is noted that she was giving over 2½ lb. of butter a day at the end of her test.

This great producer is by that noted sire Brighton King (imp.). When I first saw Brighton King at Mr. Cox's farm, near Mudgee, I declared him to be the best Jersey bull I had seen up to that time in Australia.

Mr. McDonald feeds his cows very liberally, giving 8 lb. of concentrated food daily and 4 lb. of lucerne chaff in addition to natural pasture. The natural pastures at Ingleburn, however, are not at all rich, and as the district is more or less subject to droughts it is absolutely necessary to hand-feed there in order to get results.

The Shorthorn returns are headed by that beautiful cow Empress, the property of Mr. T. J. Young, of Bangalow, she having given the exceptional record of 15,073 lb. of milk, yielding 736 lb. of butter. This is the best performance put up by a Shorthorn under the official test to date. Empress was giving 2½ lb. of butter a day at the completion of the nine months' test.

Some very good records have been put up by the Darbalara Shorthorns. Their average is an excellent one, but there are no record breakers in the list. Probably the performance of the 2-year-old cow Melba 9th is the most creditable. A cow on her first calf that gives 9,351 lb. of milk, producing 471 lb. of butter, is something very exceptional, more especially when it is borne in mind that on the last day of the test she was giving over 2 gallons of milk a day, and nearly 1¼ lb. of butter.

The 3-year-old cow Melba 8th gave 11,295 lb. of milk, producing 516 lb. of butter. This is a performance of exceptional merit, especially when it is considered that this cow does not appear to have been hand-fed. The Darbalara alluvial flats, however, produce such a variety of rich pasture in a good season that there is no necessity to hand-feed cows there except when a period of drought sets in, or during the winter months.

For Ayrshires Mr. Pritchard's herd has done well, his 5-year-old cow Orange Blossom giving 10,848 lb. of milk, which produced 526 lb. of butter.

Guernseys are represented by Mr. E. P. Perry's herd; his 4-year-old cow Lavender gave 435 lb. of butter.

In all cases the milking period was 273 days except where otherwise noted.

New South Wales Government's Herd at Hawkesbury Agricultural College.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
		Jerseys.					
	yrs.	1915.	lb.	lb.	%	lb.	lb.
Lady Belle	2	18 Nov....	3,475	219	5·3	11	·79
Terrara	2	25 ,, ...	3,601	212	4·8	12	·85
Culcairn II	2	4 ,, ..	3,807	246	5·3	10½	·82
Comfort	2	15 ,, ...	3,880	225	4·9	13	1·00
Blue Bell	2	4 ,, ...	4,522	253	4 6	14½	·89
		1916.					
Thessaba	2	5 Feb. ...	3,393	240	6 0	10	·78
Wagga Moss Rose	2	24 ,, ...	3,909	240	5·1	11	·83
,, Thisbe	2	24 ,, ...	3,819	238	5·1	12½	·84
,, Aspen	2	18 Mar....	3,438	218	5·1	9½	·71
,, Irene	2	3 ,, ...	3,745	239	5·4	9	·72
,, Fancy	4	7 April..	5,146	311	5·0	14½	·98
,, Fay	4	7 ,, ...	5,184	306	5·0	17½	1·04
,, Aroon	2	8 ,, ...	3,883	244	5·2	10½	·81
Rum Omelette IV	2	13 ,, ...	3,673	249	5·6	8½	·67
Lally Optician II, 20	2	29 Mar. ..	2,977	223	6·3	· 9½	·73
Culcairn III	2	30 ,, ...	3,522	228	5·7	14	·94
Wagga Patricia	4	27 April..	5,322	321	5·1	15	·92
Isabella, 248	2	14 Mar....	3,280	201	5·2	11½	·71
Trenton's Beauty...	3	26 May...	4,495	276	5 2	12½	·93
Pride of Berry	3	26 ,, ...	3,627	251	5·8	7	·57
Bridesmaid	2	3 July ...	3,222	218	5·7	8	·69
Lady Newman, 2176	6	14 June...	4,524	300	5·6	15	1·04
Heath	2	7 Aug....	3,765	256	5·7	10	·84
		Red Polls.					
Gesture II	4	13 April..	6,229	324	4·4	17	·93
Sudbourne Dahlia (imp.) ...	6	2 Aug. ..	6,886	351	4·3	15½	·80

In addition to natural pastures each cow received daily, during January and February, 40 lb. green chaffed maize and 20 lb. lucerne chaff; during March and April, 30 lb. green chaffed maize and 15 lb. lucerne chaff; during May, 40 lb. frosted maize, 15 lb. lucerne chaff and 2 lb. bran; during June, July, August and September, 20 lb. green wheat chaffed, 20 lb. American hay and 2 lb. bran; during October, November, and the first half of December, 15 lb. inferior oaten and wheaten hay and 2 lb. oilcake. In the latter part of December they were fed on pasture only.

New South Wales Government's Ayrshire Herd at Glen Innes Experiment Farm.

Name of Cow.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916.	lb.	lb.	%	lb.	lb.
Orphan Girl	...	23 Feb. ..	5,560	242	3·7	22	1·01
Hawkesbury Duchess	...	14 July ..	8,148	360	3·7	28½	1·05
Clarice of Coolangatta	5	27 Mar...	7,038	340	4·1	20	1·09
Jessamine	2	24 April	4,987	274	4·7	17	·99
Barberry	...	13 May ..	7,428	346	3·9	24	1·19
Blackberry	...	14 ,, ..	5,773	287	4·2	18½	·90
Pleasure	..	10 June ..	5,336	263	4·1	16	·99
Olive III	...	22 ,, ..	5,233	210	3·4	11½	·59

Mr. E. P. Perry's Guernsey Herd at "Nundorah," Parkville.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916.	lb.	lb.	%	lb.	lb.
La Petite Jaune (imp.), 97 ...	4	16 June...	6,663	351	4·5	19½	1·13
Brunette of the Isle (imp.), 21 ...	2	27 May...	3,913	208	4·5	12	·65
Lavender	4	10 Sept...	6,577	435	5·6	17	1·14

In addition to pasture, in June, 1916, La Petite Jaune received 6 lb. bran, 4 lb. molasses, and was grazed on green lucerne; Brunette was grazed on green barley; in July La Petite Jaune, 7 lb. bran, 4 lb. molasses; in August, pasture only; in September, La Petite Jaune, 15 lb. chopped turnips, Lavender, 20 lb. chopped turnips and 4 lb. bran; in October, pasture only; in November, Brunette of the Isle 5 lb. oaten chaff, Lavender 5 lb. chaff and 2½ lb. molasses; in December and January, 1917, pasture only; in February, 20 lb. green corn chopped in addition to pasture; March, Lavender received lucerne and oaten hay and pasture, and in April the same cow had 10 lb. oaten chaff with lucerne hay and pasture.

New South Wales Government's Guernsey Herd at Wollongbar Experiment Farm.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916.	lb.	lb.	%	lb.	lb.
Jasmine of Wollongbar	8	12 Jan. ..	6,246	301	4·1	19	1·09
Desdemona	9	21 ,, ...	5,898	304	4·3	18	·86
Pet of Wollongbar, 433	2	12 May...	3,373	206	5·2	9	·74
Princess Jasmine of Wollongbar, 425	2	25 June...	4,146	213	4·4	12	·59
Gertrude, 435	6	9 July ...	5,991	351	5 0	8	·57
Paris, 509	4	15 Aug....	5,049	304	5·1	10½	·78
Village Princess, 572	3	14 ,, ...	4,275	279	5·5	9½	·99
Annetta, G3	3	28 ,, ...	4,501	291	5·5	8	·66
First Kiss, 415	...	28 ,, ..	5,323	316	5·0	9½	·62

In addition to pastures, the cows received sorghum and cow cane; wheaten chaff was also used to some extent, fed with bran.

Mr. J. T. Young's Milking Shorthorn Herd at Bangalow.

Name of Cow.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916.	lb.	lb.	%	lb.	lb.
Empress	9	12 July ..	15,073	736	4·1	49½	2·51
Fussy	...	25 May ..	8,461	400	4·1	18	·87

In addition to pasture, Empress received during August, September, and October a little bran and sweet potatoes; in November, pasture only; in December, a little bran; and during January to April, 1917, pasture only. Fussy was fed on pasture only.

New South Wales Government's Kerry Herd at Bathurst Experiment Farm.

Name of Cow and Herd Book No.	Age at beginning of test.	Date of last Calving.	Total. Milk.	Total. Butter.	Total. Average test	Yield on last day of test. Milk.	Yield on last day of test. Butter.
	yrs.	1915.	lb.	lb.	%	lb.	lb.
ollege Bratha, 33...	3	20 Nov...	5,416	319	5·0	14½	·97
		1916.					
hadow, 269	4	22 Jan. ...	5,748	309	4·6	6½	·38
illiney, 258*	...	10 June. .	6,645	371	4·7	21½	1·13

* Period of test, 243 days only.

The rations fed daily to the cows under test during 1916 were:—For January, wheaten chaff mixed with oaten straw chaff, together with crushed grain, oats and wheat; green lucerne also was fed; for February, lucerne chaff with cracked wheat, and also green lucerne, and run on stubble; for March, lucerne chaff mixed with oaten hay chaff and oaten straw chaff, also green lucerne and run on stubble; for April, run on green cereal crops (oats), supplemented with oaten hay chaff, cracked oats, and green lucerne; for May, as in April, with oaten straw chaff in the mixture of chaff; for June, same as for May, omitting the green lucerne; for July and August, cereal fodder crops (oats), supplemented with oaten straw chaff and crushed oats; for September, early spring grass and lucerne, oaten straw chaff and crushed oats; for October, early spring pasture and some crushed oats; for November, early spring pasture and lucerne; and for December, lucerne hay, some wheaten chaff, green lucerne, and run on paddocks.

New South Wales Government's Herd at Berry Experiment Farm.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total. Milk.	Total. Butter.	Total. Average test.	Yield on last day of test. Milk.	Yield on last day of test. Butter.
Milking Shorthorns.							
	yrs.	1915.	lb.	lb.	%	lb.	lb.
Marchioness of Berry	2	15 Dec. ...	5,682	259	3·9	11½	·62
Champion VI, 141...	3	12 Nov. .	5,736	300	4·4	11½	·72
		1916.					
Gibson Girl (imp.)	Aged	30 Mar. ..	8,490	340	3·4	25	1·21
Lady Gibson	4	12 June...	6,979	326	4·0	16½	·88
Waratah of Berry, 245	10	10 ,, ..	7,338	325	3·7	20	·97
Tulip II, 436	2	1 July...	4,512	211	4·0	8½	47
Holsteins.							
		1915.					
Folkein, 135	7	27 Nov....	8,620	335	3·3	13½	·57
Berchem, 320	10	7 ,, ..	8,661	327	3 2	20	·67
		1916.					
Double Dutch, 469	5	17 April..	8,470	346	3·5	27¼	1 26
Duchess of Hanover, 373	3	22 ,, ...	6,930	255	3·2	27½	1·02
Fraulein Arama, 286	2	18 Aug....	7,379	304	3·2	8¼	·28

In addition to ordinary pastures, the cows received in the month of June 40 lb. each of Planter's Friend, and during the months of July and August and half of September, 35 lb. each of maize ensilage per day.

The Scottish-Australian Investment Company's Milking Shorthorn Herd at Darbalara.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916.	lb.	lb.	%	lb.	lb.
Virgina IV, vol. iv	4	1 July ..	10,221	486	4·0	24½	1·15
*Shamrock X, 1725	7	11 ,, ...	6,975	351	4·3	26½	1·24
Virginia III, vol. iv	5	5 ,, ...	7,467	449	5·1	17	·92
Melba IX, vol. iv	2	5 ,, ..	9,351	471	4·3	21½	1·20
Mollie, 1597	14	10 June...	7,474	367	4·2	19	1·00
Fancy II, 928	9	9 ,, ...	8,788	440	4·2	20	1·08
Viola VI, 1787	7	26 May ..	8,703	397	3·9	17	·90
Gracie II	13	17 June .	8,511	383	3·8	11½	·50
Melba VIII, vol. iv	3	11 ,, ...	11,295	516	3·9	33	1·50
Bloomer, 1295	8	4 Aug....	10,827	556	4·4	19	1·13
Champion VI, vol. iv	5	9 ,, ...	7,393	368	4·2	13½	·74
Viola V, 1786	8	5 ,, ..	6,948	311	3·8	10	·52
Shamrock XIV, vol. iv	4	11 ,, ...	10,296	515	4·2	28½	1·37
Pansy IV, vol. iv	5	17 ,, ...	9,555	430	3·8	16	·90
Alice VI, vol. iv	2	13 ,, ...	7,767	410	4·5	15½	1·02
Matilda II, 434	14	6 Sept...	7,569	379	4·2	12	·66
Lady Belle, 1509	10	12 ,, ..	7,602	406	4·5	6	·47
Rose V, vol. iv	2	31 Aug...	7,521	366	4·1	12	·69
Gem V, vol. iv	2	31 ,, ..	5,758	274	4·0	9	·52
Lily VI, vol. iv	2	11 Sept...	8,436	398	4·0	16½	·88
Bloomer II, vol. iv	3	9 ,, ...	7,057	340	4·1	12	·63
Madame VIII, vol. iv	4	19 Aug. ..	7,570	353	4·0	6½	·37
Pride VIII, vol. iv	3	2 Sept ..	8,244	401	4·1	12½	·81
Nina V, vol. iv	4	29 Aug. ..	7,252	348	4·0	11½	·64

* Period of test, 213 days only.

The whole of the cows were fed on natural pasture only, with the exception that Melba IX and Viola VI received daily for July, 3 lb. boiled maize, 3 lb. bran, 6 lb. oaten chaff; for August, Melba IX, Alice VI, and Viola VI, 3 lb. boiled maize, 3 lb. bran, 6 lb. oaten chaff; for September, Melba IX, Lily VI, and Alice VI, 3 lb. boiled maize, 3 lb. bran, 6 lb. oaten chaff; from October, 1916, to February, 1917, Lily VI, Alice VI, Melba IX, and Madame X received 1 lb. crushed oats, 1 lb. oaten chaff, and 2½ lb. bran; during March and April, Alice VI, Lily VI, and Madame X received 3 lb. bran, 3 lb. chaff and green corn.

Mr. C. R. G. Macdonald's Jersey Herd at Ingleburn.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average Test.	Milk.	Butter.
	yr. mth.	1916.	lb.	lb.	%	lb.	lb.
Maitland Zingara	3 0	24 June...	5,955	375	5·3	14	·99
Exile's Brighton Queen, 3080 ...	3 6	17 July ...	12,142	752	5·2	36	2·29
Brighton Coomassie	1 11	6 Aug....	6,199	380	5·2	20	1·56
Brighton Exile's Queen	1 10	8 ,, ...	5,800	333	4·9	16½	1·06

In addition to natural pastures each cow received daily 2 lb. each of bran, pollard, maize meal, linseed oil meal, and 4 lb. lucerne chaff.

Mr. Jas. Pritchard's Ayrshire Herd at Numba, Shoalhaven River.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916.	lb.	lb.	%	lb.	lb.
Dewdrop of Kabibinokka... ...	6	17 June...	6,531	341	4·4	20	1·09
Primrose ,, ,, ...	3	22 July...	6,549	323	4·2	22	1·14
Prune of Greystanes	8	22 ,, ...	8,932	403	3·8	24	1·19
Orange Blossom of Kabibinokka...	5	4 ,, ...	10,848	526	4·1	27½	1·48
Grace ,, ,, ...	5	24 Aug....	9,985	436	3·7	23½	1·15
Pretty Girl ,, ,, ...	5	13 ,, ...	6,169	345	4·7	13½	·82
Snowflake ,, ,, ...	3	13 ,, ...	8,647	370	3·6	22	1·07
Gem ,, ,, ...	4	26 ,, ...	8,250	350	3·6	21	·95

For the months June, July and August, 1916, the cows were fed on pasture only; in September 30 lb. ensilage in addition was fed; in October and November 20 lb. wheaten chaff in addition to pasture; in December, 4 lb. bran, 2 lb. linseed oil meal and 5 lb. wheaten chaff were supplied additional to pasture; and in January, February, March and April, 1917, they had pasture only.

Mr. S. Hordern's Jersey Herd at Retford Park, Bowral.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
		1916.	lb.	lb.	%	lb.	lb.
Muriel's Oxford Daisy (imp.), 3050.	......	31 July...	6,421	401	5·3	13	1·07
Retford Morn, 2560	......	4 ,, ...	3,967	247	5·3	3	·21
Pleasant (imp.)	......	30 Aug....	4,339	296	5·8	9½	·74

In addition to natural pastures the cows received for the months of August, September and October, 1916, 10 lb. oaten chaff, 2 lb. lucerne chaff, and 6 lb. bran; in November and December they were on pasture only; in January, 1917, the pasture was supplemented with 8 lb. bran and 10 lb. oaten chaff; in February pasture only; in March, pasture, 8 lb. bran, 6 lb. lucerne chaff, and 6 lb. green corn chaffed; and in April, pasture, 8 lb. bran and 4 lb. oaten chaff.

SCARING BIRDS FROM FRUIT TREES.

MR. E. H. DUFFY, of Parramatta, writes:—It may be of interest to the readers of the *Agricultural Gazette* to know how I effectively overcame the bird-pest trouble. I made an effigy representing a hawk, and suspended it on an overhead wire. This completely scared the small birds away, but the crows made a concerted attack on it. I therefore studded it all over with long darning needles, point outwards. On examination I found several of these broken off, and after a while the crows ceased to attack. The experiment was most successful, as I had very little pecked fruit that season.

Dairy Education in New South Wales.

TEMPORARY SCHOOL AT PORT MACQUARIE FACTORY.

M. A. O'CALLAGHAN.

THE first Dairy Science School conducted by the Department of Agriculture was held in August, 1908, at the Berry Central Factory. The object of the school was to bring the various factory managers of the district together for the purpose of giving them certain scientific and practical education. Apart from the knowledge gained, a distinct advantage of the school was that all were taught such work as cream grading on the same basis, and thus, if the cream graders at the several factories in the district conducted their operations in accordance with the information given them, the same standard would operate right through, and cream which would be classed as second-class at one factory would receive exactly the same classification at any other factory in the district.

The school referred to proved such a success that the Department of Agriculture, through the Dairy Branch, extended the system, and since then several schools have been held in the principal dairying districts in New South Wales, whereat lectures and practical demonstrations have been given in the bacteriology of milk, cream, and butter. The practical work of cream grading went hand-in-hand with the examination of the creams bacteriologically, so that students would understand that cream underwent most of its changes as a result of bacterial activity. Elementary dairy chemistry was also one of the subjects taught at these schools, and students were given practice in the simple methods of cream and butter analysis.

At first these schools were attended mainly by factory managers, but later on their assistants, including butter-makers, attended; and many of these obtained certificates in cream grading, so that when the Dairy Industry Act was passed in December, 1915, almost all the managers of factories in New South Wales and a very large percentage of butter-makers and cream-graders held certificates of proficiency in cream grading from the Department of Agriculture. In addition, nearly all testers employed to test cream of butter-fat at such factories held departmental certificates also. On the passing of the Act referred to, it became necessary for every person who graded or tested cream at a factory to hold a permit or certificate under the Act, authorising them to do so, and before the granting of such permit or certificate the person concerned had to undergo a practical test to show his proficiency. Those who had already obtained the certificate of the Department of Agriculture were exempt.

Owing to the outbreak of war causing a number of certificated men to enlist, as well as to other causes, the demand for certificated cream-graders was greater than the supply. These men are paid a minimum standard wage of £3 5s. per week, and any factory requiring the services of a first-class man must pay something more than this before a cream-grader will leave one factory to go to another. As the cream-grader is the second most important man in the factory, there is little doubt that in time the salaries of these men will depend entirely on their knowledge and capacity. It goes without saying that a man who can grade 90 per cent. of his creams accurately is of more value than a man who can grade only 80 per cent.

Port Macquarie School.

The school recently held at Port Macquarie was attended by thirty students, the greater number of whom were young men desirous of obtaining certificates in cream grading. All of these had had at least one or two years' experience in butter factory work, while some of the managers who attended had had several years' experience.

Group of Instruction Staff and Students at the Pcrt Macquarie Dairy School.

This school had the largest attendance of any yet held, and as a matter of fact a smaller number would have been preferable; for though any number within reason can receive lectures, the difficulty in giving practical work to such a large number is considerable, as the ordinary factory operations cannot be seriously interfered with. However, the school turned out a pronounced success, as far as results were concerned; and out of twenty-seven who presented themselves for the cream-grading examination, twenty succeeded in attaining to the standard necessary to pass. This is 80 per cent. correct classification, according to the standards laid down under the Dairy Industry Act, which is as follows:—

> Where any person has been engaged in the practice of cream grading for a period of not less than one year he may be given a permit to grade cream under the Act, provided he, under examination by an officer appointed by the Minister, correctly classifies twenty-four creams out of a total of thirty: Provided that all those holding the cream-grader's certificate of the Department of Agriculture may be taken to have reached the necessary standard for the issue of this permit.

Of the number who attended, nine had attended at least one or two such schools previously, and were therefore well grounded in the routine. Of the new men who attended the school for the first time, it must be pointed out that their knowledge of cream grading was, on the average, better than that exhibited by students in former years. This is attributed to the fact that in every butter factory there is now a registered cream-grader, who works according to standards; and the men assisting these registered graders are therefore taught their business on uniform lines. I expect that, as years pass by, we shall find young men presenting themselves for examination for certificates who will show such proficiency that it will not be necessary to spend much time in standardising them prior to subjecting them to the necessary test or examination. In this way the Dairy Industry Act will have a very powerful educational influence on the workers in butter factories.

LIST OF NOXIOUS PLANTS, SHOWING THE NAMES OF THE AREAS IN WHICH SUCH PLANTS HAVE BEEN DECLARED TO BE NOXIOUS SINCE 1ST JANUARY, 1917.

The following list has been supplied by the Local Government Department:—

Noxious Plant.		Area.	Described in *Agricultural Gazette.*
Scientific Name.	Common Name.		
Amsinckia intermedia ...	Yellow Forget-me-not ...	Coreen Shire	Vol. XVI, p. 27.
Carduus lanceolatus ...	Black Thistle or False Scotch Thistle.	Botany Municipality ...	Vol. VI, p. 223 (illus.).
Carthamus lanatus ...	Saffron Thistle or False Star Thistle.	Abercrombie Shire ...	Vol. V, p. 298 (illus.).
Centaurea calcitrapa ...	Star Thistle or Chinese Burr...	Botany Municipality ...	Vol. V, p. 468 (illus.).
Centaurea melitensis ...	Star Thistle	Botany Municipality ...	Vol. VI, p. 149 (illus.).
Chrysanthemum segetum	Wild Marigold	Botany Municipality ...	....
Cryptostemma calendulacea	Cape Weed	Casino Municipality ...	Vol. XXVII, p. 247 (col. plate).
Datura Stramonium ...	False Castor Oil Plant ...	Botany Municipality ... Coreen Shire.	Vol. II, p. 311 (illus.).
Echium plantagineum ...	Paterson's Curse	Goobang Shire ... Gilgandra Shire. Gundagai Municipality.	Vol. XXVIII, p. 409 (illus.).
Eichhornia crassipes ...	Water Hyacinth	Kyogle Shire	Vols. XXII, p. 509, and XI, 446 (illus.).
Emex australis	Cat's Head	Botany Municipality ...	Vol. XX, p. 870 (illus.).
Hypericum perforatum ...	St. John's Wort	Mitchell Shire ... ... Holbrook Shire.	Vol. XXVIII, p. 413 (illus.).
Lantana Camara ...	Lantana	Tenterfield Shire ... Botany Municipality.	....
Myriophyllum	Thread of Life	Kyogle Shire .. ... Tintenbar Shire.	....
Onopordon acanthium ...	Scotch Thistle or Heraldic Thistle.	Botany Municipality ...	....
Phytolacca octandra ...	Red Ink Plant or Dye Berry...	Botany Municipality ...	....
Rosa rubiginosa	Sweet Briar	Gundagai Municipality Botany Municipality.	....
Rubus fruticosus	Blackberry	Waverley Municipality	....
Sida rhombifolia	Paddy's Lucerne or Queensland Hemp.	Botany Municipality ..	Vol. V, p. 537 (illus.).
Solanum sodomaeum ..	South European Nightshade or Apple of Sodom.	Botany Municipality ...	....
Xanthium spinosum ... [redacted]	Bathurst Burr	Botany Municipality ... Gundagai Municipality.	Vol. VI, p. 445 (illus.).
Xanthium strumarium ...	Noogoora Burr	Botany Municipality ...	Vol. X, p. 1043 (illus.).

The Prickly Pears of Interest to Australians.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist of New South Wales, and Director, Botanic Gardens, Sydney.

No. 14. *Opuntia brasiliensis* Haw.

Under *O. vulgaris* (No. 15 of this series, to be next published), a brief account will be given of Prickly Pear legislation in New South Wales. In the principal Act providing for the destruction of Prickly Pear (the chief pear then being considered to be *O. vulgaris*), provision was made for other species of pear to be declared noxious by the Governor as circumstances arose. One of the schedules, subsequently published, proclaimed—

Opuntia brasiliensis,
Opuntia monacantha,
Opuntia tuna.

Thus it is that *O. brasiliensis* becomes of importance to us in New South Wales.

This is a remarkable and unique Prickly Pear, forming a sub-section by itself. Through an unfortunate confusion with *O. monacantha* Haw. in Australian gardens (see No. 7 of this series, *Agricultural Gazette* for October, 1913), it was assumed to be in New South Wales, and hence was legislated against as already indicated.

The species is described in Haworth's *Suppl. Pl. Succ.*, p. 79, a work which I have been unable to consult.

Following is the earliest description available to me :—

> *O. brasiliensis* (Willd. *Enum. Suppl.* 33, under *Cactus*). Stem terete ; joints of branches compressed, flat, ovate ; spines strong, solitary. Native of Brazil. *Cactus paradoxus* Horn. *Hort. Hafn.* 2, p. 443. Hoffms. *Verz.*, 1826. p. 72. Pis. *Bras.*, p. 100, f. 2. Flowers yellow. Brasilian Indian fig. Fl. Jul. Aug. Clt., 1816. Sh. 4 to 6 ft. *Hist. Gard. and Botany*, Don, vol. 3.

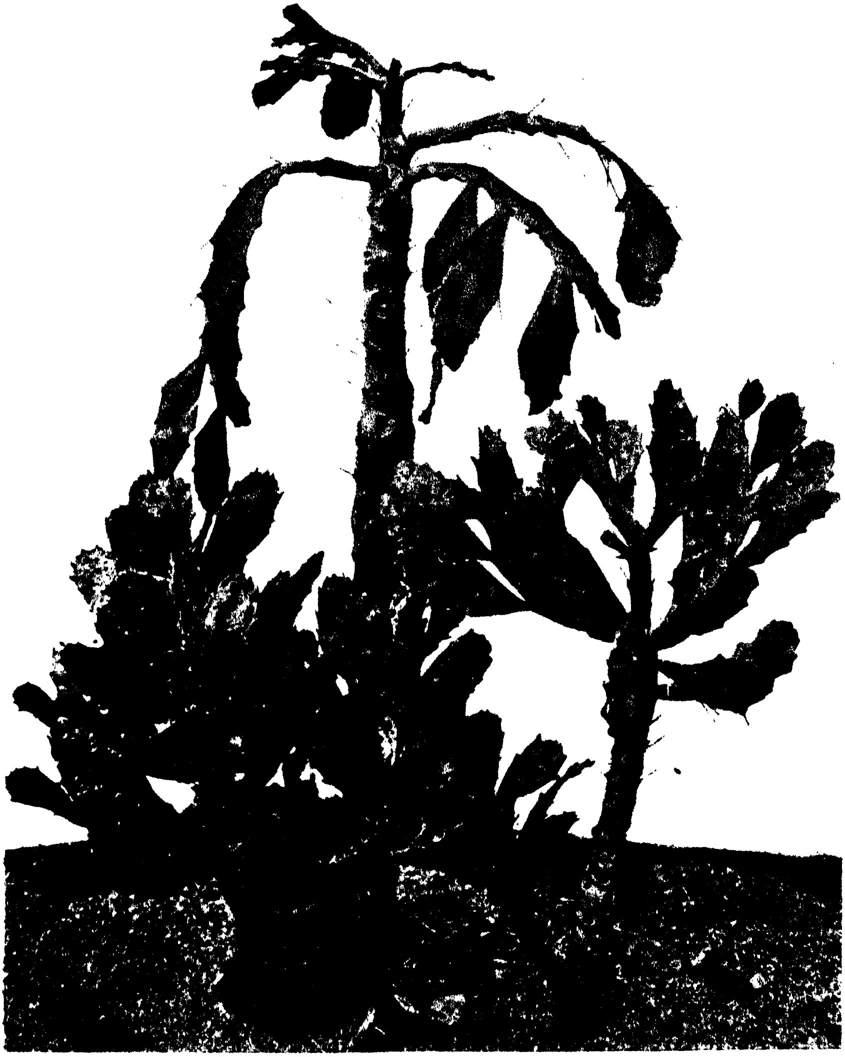
This is a translation of DC. *Prodromus* iii, 474.

I believe the first plant which ever arrived in Australia was imported by me, and, to calm fears, there is not the slightest possibility of it ever becoming a pest. It is a tropical species of slow growth with us.

It has thin, flattened joints (" leaves "), with pure lemon-yellow, wax-like flowers, of a lustre quite unique in the genus in my experience.

The habit of the plant is peculiar, and perhaps unique also ; it has been described by A. Berger in the following words :—

> It forms a main stem which continues growing at the top, being terete, while the branches are flat. When old, the plant forms a tree, the lower branches falling off, just as do those of some *Euphorbias*,—for example, *E. grandidens.*



Opuntia brasiliensis Haw.

PRICKLY PEARS OF INTEREST TO AUSTRALIANS.

I quote this, because it is based on plants growing in north-western Italy, under climatic conditions approximating to those of Sydney, but the following account, taken from *Bot. Mag.* t. 3293, is from the pen of the Rev. J. T. Lowe, a well-known botanist, and refers to its growth in the warmer climate of Madeira.

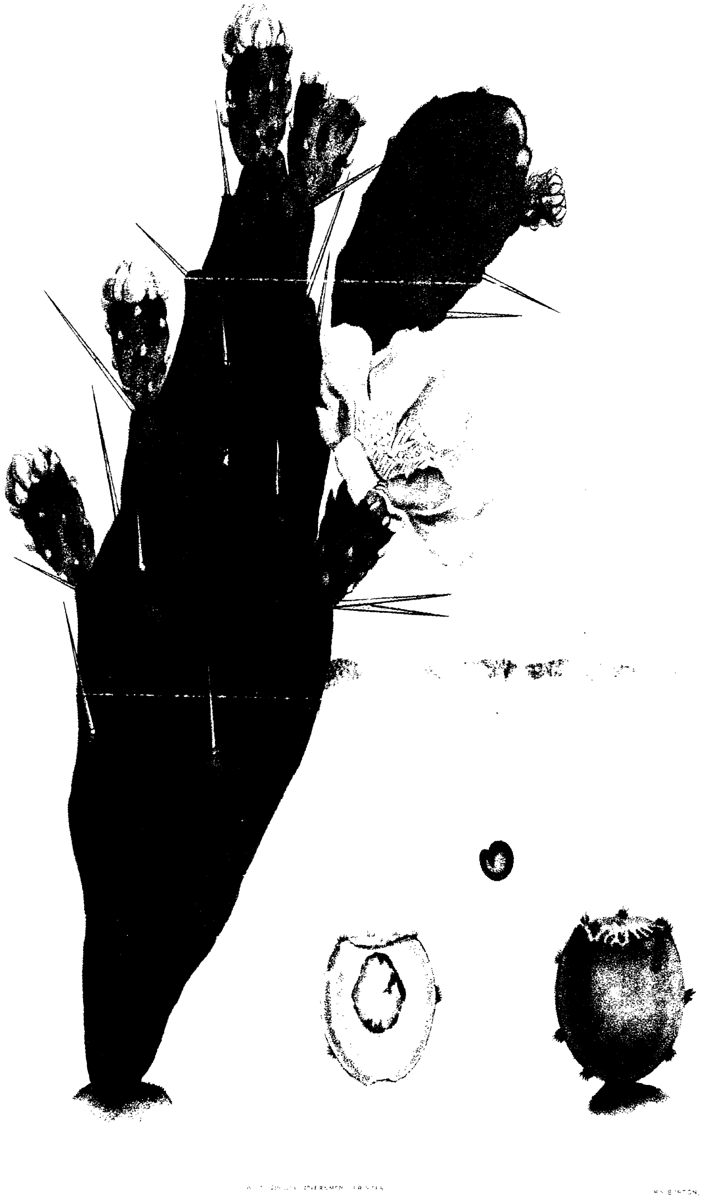
> The peculiar habit and mode of growth at once distinguish this species. It rises with a perfectly straight, erect, slender, but firm and stiff round stem, to a height of from 10 to 20 or even 30 feet, very gradually tapering to a point from a diameter of 2 to 6 inches at the base, and furnished all the way up with short, mostly horizontal or declining branches, spreading round on all sides not more than a yard in any part from the main stem, and gradually becoming shorter upwards, often altogether ceasing a little below the summit. The whole plant resembles a straight, taper pole, artificially dressed up with branches. Main stem perfectly round, continuous and straight throughout; formidably armed with fascicles of long, slender, subulate, very sharp, pale or ash-coloured spines, several together. Branches horizontal or declining, short, from flattened or triangular becoming downwards round; armed with spines like those of the stem, but fewer in a fascicle. The ultimate joints are obovate or obovate-oblong, approaching often to lanceolate, sometimes truncate; the margins a good deal sinuated. They resemble leaves in appearance and thickness more than in any other described species of *Opuntia.* They are armed on both sides with solitary, long, slender, subulate spines, which are white with chestnut-brown tips, and very sharp; each seated at the summit of a slight, irregular tubercle; the down at their base is obsolete or altogether wanting. The whole plant is a bright green inclining to yellow, especially in young or sickly plants; the lower part of the stem only is brownish-ash coloured.
>
> The flowers are bright lemon-yellow, middle-sized; when expanded, from an inch to an inch and a half in diameter.
>
> Fruit subglobose, approaching to oval more or less, with the cup-shaped hollow at the top obsolete, so as to be often truncate, from an inch to an inch and a half in diameter, the colour of a magnum-bonum plum; perfectly even, but furnished with short, dense fascicles, tufts, or branches, of rich chestnut-coloured bristles, contrasting beautifully with the delicate transparent yellow of the thin, smooth skin. A few of these are twice as long as the rest. All are extremely deciduous, brittle, and acute, so as to render the examination of the fruit more than ordinarily troublesome. It is hardly possible to touch the plant when in fructification without getting the skin or clothes full of these bristles. Inside of the fruit pale-yellowish white, containing in the middle from one to four, much flattened, rather large, round seeds, three or four lines in diameter, enveloped in a singular, dense, cottony mass of fibres. The fruit is rather agreeable, juicy, with a fine acid, somewhat resembling an indifferent, hard-fleshed, or unripe plum, with a smell and slight flavour like the leaf-stalks of garden rhubarb.

It is a native of Brazil and the Argentine, and is tender in the Sydney district, wilting somewhat during the winter, though it flowers every year. It does not, however, fruit every year with us.

The plant in the Sydney Botanic Gardens is under 4 feet high. It shows the characteristic habit already described, though not as well as it did before on two occasions when it had to be severely cut back owing to the exigencies firstly, of a road, and secondly, of the City railway. It is hoped that it is now in a permanent position.

AFTER consultation with the Department of Agriculture, the Principal Librarian, Sydney, has decided to establish a library for the circulation of agricultural literature amongst the various branches of the Agricultural Bureau. Several sets of about thirty books, each dealing with all departments of agriculture and allied subjects, are now available for loan to branches, and secretaries whose members desire to participate in the advantages of the circulation should make application to the Principal Librarian, Sydney.

AGRICULTURAL GAZETTE OF N.S.W. JULY, 2, 1917.



M. FLOCKTON DEL.   W. A. GULLICK GOVERNMENT PRINTER   H. S. BARTON, LITH.

OPUNTIA BRASILIENSIS Haw.

Weeds of New South Wales.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

The Bathurst Burr (*Xanthium spinosum* Linn.).*

THIS pest owes its name to its having been first prominently brought to notice at Bathurst, in this State. At the present time no product, no institution of the "City of the Plains," is so identified with it as this wretched weed. The association clings to Bathurst as tenaciously as the burr to a fleece; but it is undeserved, as the weed is far more abundant in some other parts of the State.

It originally came in the tails of horses from Valparaiso, Chili, South America, in the forties. I think it came to Twofold Bay first. Not many years afterwards it arrived at Bathurst, *viâ* Molong. At Bathurst it was first noticed on the site of the Old Black Bull Inn, corner of Bentinck and Howick streets.

Botanical Name.—*Xanthium*, Greek *Xanthos*, yellow, some plants belonging to the genus having been used in ancient times by the Greeks to dye their hair. *Spinosum*, Latin, in allusion to the strong spines possessed by our plant.

Popular Description.—A rigid, much-branched, annual shrub, of 1 to 3 feet high, very spinous. The fruit is nearly egg-shaped and covered with hooked prickles.

Well known as the plant is, many people are still ignorant of it; the object of this article is to forewarn such, and to stimulate to action those who know the pest, and who are passive in regard to it.

Botanical Description.—This will be found at page 535 of the third volume of the *Flora Australiensis*. The Bathurst burr belongs to the same family as the Daisy, viz., the *Compositæ*. It is what is called a monœcious plant—that is to say, the male and female flowers are distinct, though on the same plant. The female flowers are of course succeeded by the fruit, and these fruits form the burrs to which the noxiousness of the plant is mainly due. The hooked prickles on the fruits seem to be wonderfully contrived to attach themselves to wool, &c. The trifid, or three-pronged spines, are very strong, and increase the formidable nature of the plant.

What our farmers and pastoralists say of it. [See page 236, *Agricultural Gazette*, April, 1895.]—Its hooked fruits readily attach themselves to the hides and fleeces of animals, and the clothing of man. The presence of these burrs greatly depreciates the value of wool; what with the actual deterioration of wool, and the cost of the labour in eradicating the plant, it must have cost the State enormous sums already, and is at the present time a steady drain on the resources of the State.

*** Much of the information in this article was published in Volume VI, but it is reprinted for general information.**

Is the Bathurst Burr poisonous?—In the year 1880, Dr. Joseph Bancroft read a paper before the Queensland Philosophical Society, entitled "The newly-introduced poisonous burr, *Xanthium strumarium.*" This plant was reputed to have caused the death of a number of cows, and Dr. Bancroft, having experimented on small animals with an extract of the plant, pronounced it to be poisonous. He adds, "To follow out further the inquiry into the properties of the genus *Xanthium,* I prepared extract from *X. spinosum,* the so-called Bathurst burr. This plant is not eaten by cattle, and in its young state possesses none of the soft, tempting foliage of *X. strumarium,* so that we never hear of cattle being poisoned by eating it. Extract of the Bathurst burr gave similar results, differing in no way from the poison of *Xanthium strumarium.*" I refer my readers to the paper itself, but such advances have taken place in the methods of inquiry into poison-plants during the last few years that I do not think Dr. Bancroft himself would now consider his experiments conclusive. At the same time, I invite my readers to state any evidence they can bring forward which may seem to point to the poisonous nature of the Bathurst burr. Speaking of *X. strumarium,* which in America is known as Cocklebur or Clotbur, Mr. Goff, Bulletin No. 39 of the Agricultural Experiment Station of the University of Wisconsin, says: "It has been said that the plant is poisonous to cattle, but this is probably a mistake. It is at least known that cattle sometimes eat sparingly of it without serious results." (See an article by me on *X. strumarium,* "Noogoora Burr," in the *Gazette* for October, 1899.)

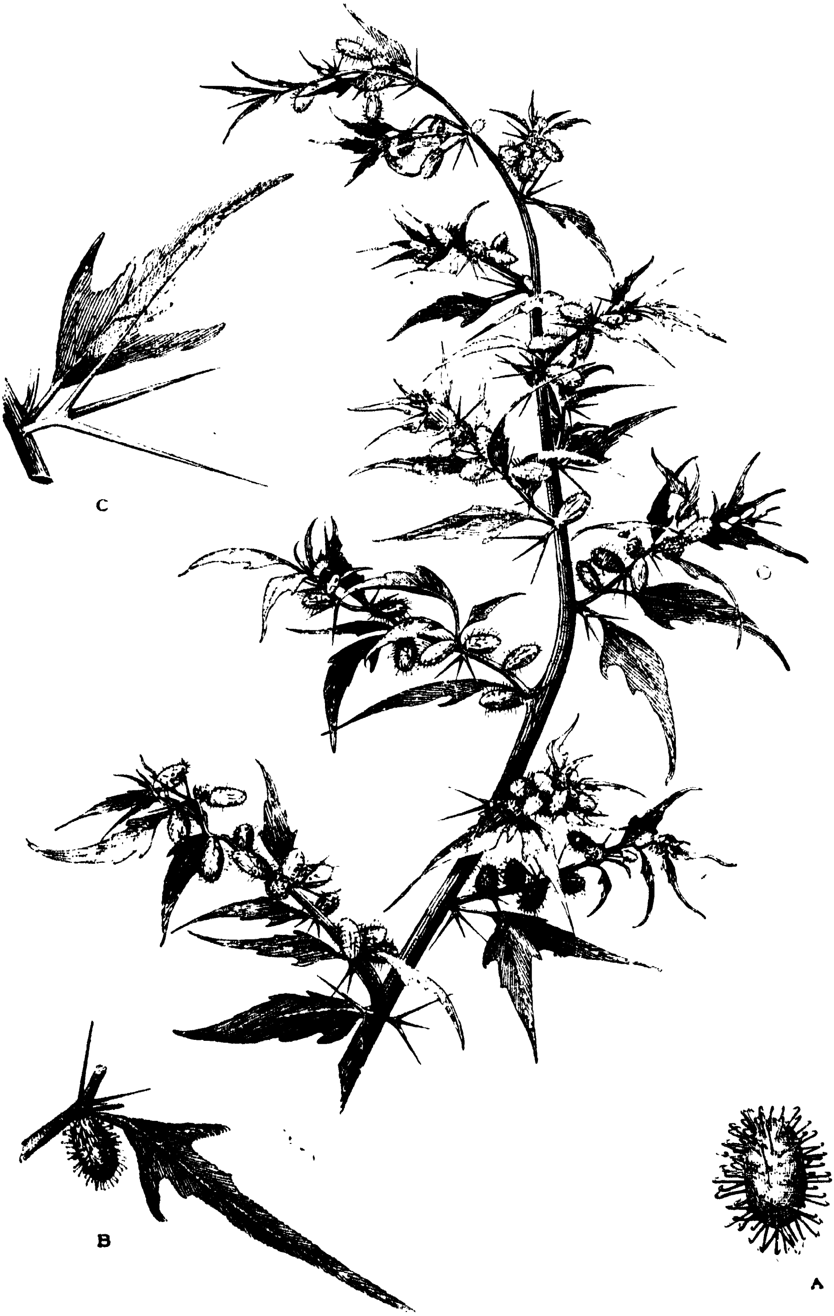
How to get rid of it.—It is too much to expect to entirely get rid of this all-prevailing pest, but, with patience, it can be largely kept in check. It should be prevented from maturing seed, and, therefore, it should be cut down with a hoe or mattock in the spring or summer; where convenient it is also desirable to burn the plants as soon as they are dry enough to admit of this being done, as large quantities of seeds are produced, the destruction of which should be ensured. Serious as has been the spread of this weed already, it is still spreading, and to permit this to go on unchecked is simply unpardonable. I am quite aware that farmers and pastoralists have not, as a rule, the funds with which to employ sufficient labour for its extirpation, but, even under present conditions, much more can be done to combat this terrible pest. I would still remind those in charge of roads of the amount of good they can do to the country by insisting on keeping the roadsides free from the worst weeds. In this connection the roads are the arteries of the country; along them course things good and bad, and bad weeds allowed to establish themselves on the roads will as assuredly contaminate the surrounding country, as impure blood will induce disorders throughout the animal system. Let us have some enthusiasm in this matter of weed-repression.

EXPLANATION OF PLATE.

Bathurst Burr (*Xanthium spinosum* L.).

A. Fruiting head (Burr), covered with prickles (enlarged).

B and C. Leaf, showing also the strong trifid spines (both natural size).



WEEDS OF NEW SOUTH WALES.

THE BATHURST BURR.

Xanthium spinosum Linn.

Its introduction to South Africa is attributed to the Merino sheep brought from Europe. Writing in 1873, Dr. Shaw (*Journ. Linnean Soc.* xiv, 202) says: "The weed extended itself throughout the sheep-walks of the Colony to such a degree, and so endangered the character of the wool through its achenes, that special legislative enactments have been made in regard to its extirpation; and rigid enforcement of penalties alone has kept it from being a sweeping curse to the wool-producers in the Orange River Republic, where only until last year this weed was allowed to revel undisturbed, it had so affected the wool of some parts of the country as to make it nearly unremunerative as a staple product. Tardy legislation on the obnoxious introduction had to be adopted there also." In a note in the *Victorian Naturalist,* vol. 71 (1888), Consul Layard, of Noumea, stated it was introduced to the Cape in a cargo of wool wrecked off Cape Agulhas and spread out to dry on the shores of Simon's Town. He adds that he "believes and hopes that he destroyed the first and last plant of Bathurst burr that sprang up in New Zealand, about 1863." Unfortunately, as we find from Cheeseman's "Flora," it is by no means scarce in the North Island of New Zealand, while I feel sure it was an introduction before 1863.

Magnitude of the Pest in New South Wales.—The Bathurst burr (leaving out Prickly-pear, which is in a class by itself) is far and away the most widely diffused and most-feared weed pest in New South Wales. Up to May, 1917, it had been proclaimed a noxious weed in ninety-three municipalities and ninety-nine shires, making 192 local authorities in all. The next pest is the blackberry, which is proscribed by eighty-eight municipalities and shires altogether.

It always seems to have been our premier pest. Mr. L. Shepherd, of the Darling Nursery, Sydney, wrote in December, 1856, to the *Sydney Magazine of Science and Art,* i, 109; and Mr. F. Creswick, in June, 1858, had a paper in the same magazine, ii, 23, urging its importance and suggesting its destruction.

The following is the list, as furnished by the Local Government Department, of municipalities and shires in which the Bathurst burr is proclaimed:—

UNICIPALITIES.

Aberdeen
Adamstown
Albury
Alexandria
Annandale
Armidale
Ashfield
Ballina
Balmain
Balranald
Bathurst
Bega
Bingara
Botany
Braidwood
Burrowa
Burwood
Camden
Campbelltown
Carcoar
Casino
Concord
Coonamble
Cootamundra
Coraki
Corowa
Cowra
Drummoyne
Dubbo
Dundas
Forbes
Glebe
Glen Innes
Goulburn
Grafton
Grafton South
Granville
Gundagai
Gunnedah
Hamilton
Hay
Homebush
Hunter's Hill
Inverell
Junee
Kempsey
Kiama
Lambton
Lismore
Maclean
Maitland East
Maitland West
Manilla
Manly
Mascot
Merewether
Moama
Molong
Mosman
Moss Vale
Mullumbimby
Murrumburrah
Murrurundi
Murwillumbah
Narromine
New Lambton
Newcastle
Nyngan
Orange
Peak Hill
Penrith
Picton
Queanbeyan
Quirindi
Richmond
Rockdale
Singleton
St. Peters
Stockton
Temora
Tumut
Ulladulla
Ulmarra
Wagga Wagga
Walcha
Warren
Willoughby
Windsor
Wollongong
Yass
Young

SHIRES.

Abercrombie
Adjungbilly
Ashford
Bannockburn
Barraba
Bibbenluke
Bellingen
Berrigan
Bogan
Bolwarra
Boolooroo
Boomi
Bulli
Burrangong
Byron
Canobolas
Carrathool
Cessnock
Cobbora
Cockburn
Coolah
Coolamon
Coonabarabran
Copmanhurst
Coreen
Crookwell
Culcairn
Dalgety
Dorrigo
Dumaresq
Gadara
Gilgandra
Gloucester
Goodradigbee
Gostwyck
Gundurimba
Gunning
Gwydir
Harwood
Holbrook
Illabo
Imlay
Jemalong
Jindalee
Kyogle
Lachlan
Lake Macquarie
Liverpool Plains
Lockhart
Lyndhurst
Macintyre
Macleay
Macquarie
Mandowa
Manning
Marthaguy
Mitchell
Monaro
Mulwaree
Mumbulla
Murray
Murrumbidgee
Murrungal
Nambucca
Namoi
Narraburra
Nundle
Nymboida
Orara
Patrick Plains
Peel
Port Stephens
Severn
Stroud
Talbragar
Tamarang
Tarro
Tenterfield
Terania
Timbrebongie
Tintenbar
Tomki
Tumbarumba
Tweed
Urana
Wakool
Walgett
Wallarobba
Waradgery
Warrah
Waugoola
Windouran
Wingadee
Wollondilly
Woodburn
Wunnamurra
Yallaroi
Yanko
Yarrowlumla

It is legislated against by the Commonwealth and all the States.

Where found.—It is believed to be a native of Chili, South America, but it has spread to most warm countries of the world.

Stinkwort (*Inula graveolens* Desf.).*

Botanical Name.—*Inula,* a Latin classical name for Elecampane, and, perhaps, a contraction of the word *Helenium,* which was applied to the same species. By mediæval writers it was written *Enula* (Bentley and Trimen). *Graveolens,* the Latin word for strong-smelling.

Botanical Description.—This will be found by persons interested in the botany of the plant at page 468 of vol. v of De Candolle's *Prodromus.* It is there described as a hairy-viscid, very branched, small shrub; the lower leaves being oblong-lanceolate and sub-dentate, while the upper leaves are linear and entire.

Is Stinkwort of any value as a forage plant?—We must answer this question in the negative. It is quite true that cattle will nibble at it with their other pasture, and may also be attracted to the plant itself and eat it moderately when other feed is available to them, but, as a very general rule, stock of all kinds avoid it, and so, unless it is pulled up or ploughed up, it matures and produces a plentiful crop of feathery seeds. Cows should be carefully kept from it, and also animals intended for food, as the flesh of animals fed on it will be coarse, strong-tasted, and bitter, while the milk, butter, and cheese will be spoiled.

Stinkwort is now thoroughly well known. It has been a terrible pest in South Australia for many years, and the agricultural literature of that State contains abundant references to it. The *Garden and Field,* and the

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* Most of the information in this article was published in Volume VI, but it is reprinted for general information.

Journal of the Bureau of Agriculture, of the southern State have, in particular, taken notice of this very bad weed, and I have made some references to these very valuable publications.

Following is an account of an attempt to render Stinkwort more palatable to stock, but an unsuccessful one, and I think that it is the feeling of most people that it is hardly a matter for regret that this bad-smelling plant does not often tempt the appetite of our domestic herbivorous animals.

A Mr. Royston Roberts, in the *Garden and Field* for May, 1890, gives an account of his method of making Stinkwort ensilage, or rather Stinkwort hay, in layers with salt between the layers. He says: "Like ensilage, horses require a few days to get used to it, and afterwards they seem to prefer it to the best hay. Cattle eat it greedily. If given to cows in milk it gives the butter a slightly bitter taste. I regard it as one of the best of our summer fodder-plants, and if ploughed in early before it seeds it makes excellent green manure."

Mr. Roberts' example was followed by Charles Rake and Sons, Enfield, S.A., and they report (*Garden and Field,* June, 1890) that after leaving the Stinkwort in the silo for six weeks, they placed it before some hungry young stock, but, beyond licking off the salt, the silage remained untouched by the animals.

Some uses for Stinkwort.—It is said that every plant has its use, if we can only find out that use, and no doubt there is a large amount of truth in this homely saying At present, as regards Stinkwort, its only practical use of importance is that of green manure, but then only as an adjunct to eradication of the pest, for its manurial value is not very high.

In this connection the following notes are of interest:—The *Garden and Field* (January, 1891) says: "We hear of several persons who can trace a considerable and distinct increase in the yield of cereal crops through the enrichment of the soil by this weed when treated as a green manure."

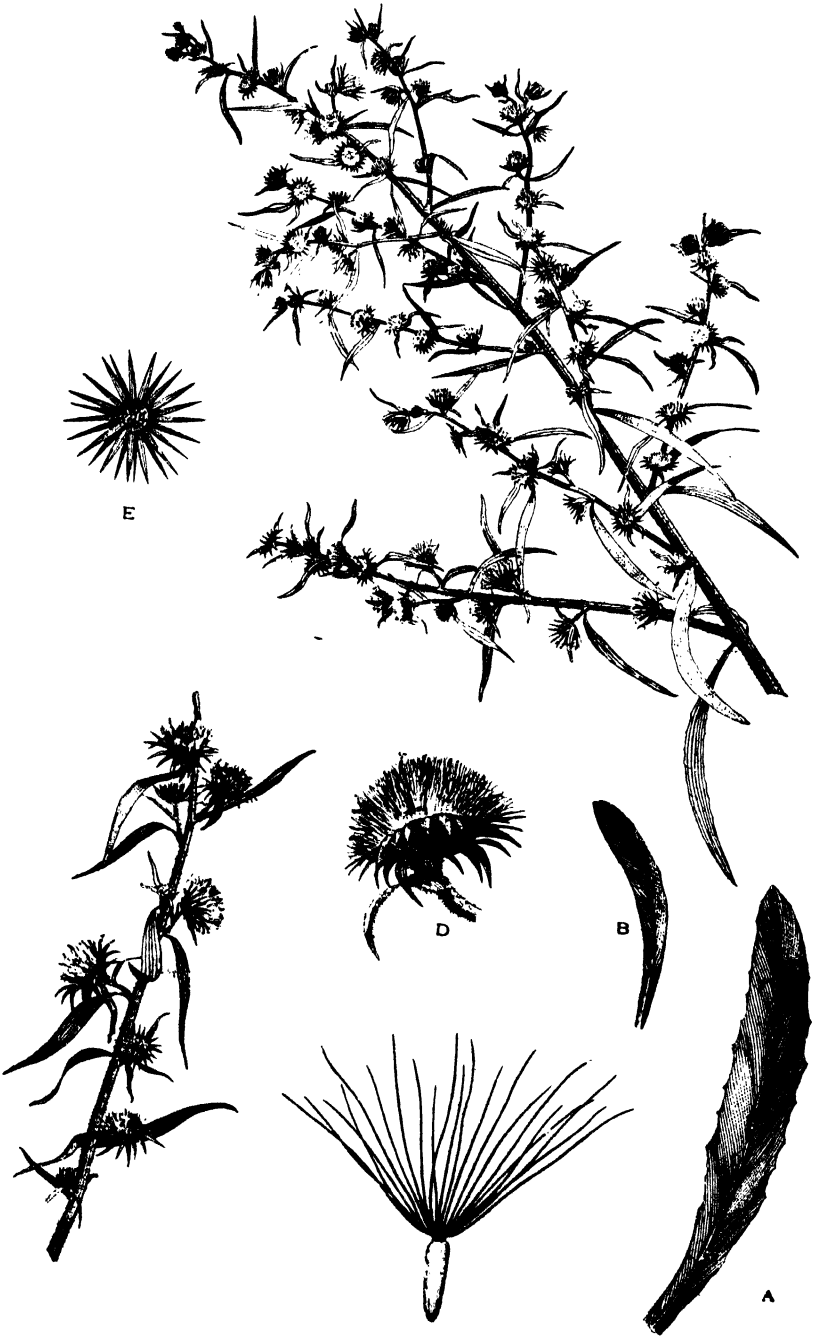
Nearly four years later it was reported (*Garden and Field,* December, 1894) that one of the few crops of wheat in the Lyndoch (S.A.) district resulted from the ploughing in of coarse green Stinkwort, which kept the land open and drained it. On the other hand (January, 1895), a Mr. Stewart reported that on 2 acres of land he ploughed the Stinkwort under and he only got a return of 10 bushels to the acre, while he got a return of 30 bushels when he hoed the weed up and burnt it, the seasons being much alike as regards rainfall.

We must await further information in regard to its value as a manure, although I am not hopeful that it will prove to be of much value, as already stated.

EXPLANATION OF PLATE.

Stinkwort (*Inula graveolens* Desf.).

A. Lower leaf, oblong-lanceolate and sub-dentate.
B. Upper leaf, entire and nearly linear.
C. Portion of flowering twig.
D. Flower-head, passing into fruit.
E. Receptacle, showing concave depressions and radiating bracts.
F. Seed with pappus.



WEEDS OF NEW SOUTH WALES.
STINKWORT.
Inula graveolens Desf.

In the 1894 report, page 60, of the firm of Merck, of Darmstadt, we find "*Extractum Inulæ graveolentis spir. spiss.*" In other words, dried alcoholic extract of Stinkwort. It is prepared from the leaves, freed from essential oil. The report goes on to say: "It was known to the ancient Greeks, and has long been used for colic, dysuria, and amenorrhœa. In Australia it has been used as an anti-asthmatic. The plant, or rather the extract obtained from it, has lately become more interesting, as M. Mendelsohn (*Deutsch. med. Wochenschr.*, 1894, No. 30) produced with it paralysis of respiration and the locomotor apparatus in animals of various species. Closer investigations proved that in symptoms of paralysis two different substances are concerned, of which one convulses the front extremities, whilst the other produces paralysis of the hind extremities, which latter eventually predominates in the general effect. These results of investigations might lead to practical application of the remedy."

But do not let these investigations incline the farmer to look upon Stinkwort with a more tender eye, for even if a very large demand (which is exceedingly unlikely) were to spring up for this drug, it could be readily satisfied from its native home on the shores of the Mediterranean.

In the *Garden and Field* for July, 1894, it was pointed out that in Europe the dried plant is used for smoking bacon and hams. One gentleman in South Australia tried the experiment, and reported it to be a success.

Elecampane (*Inula Helenium*) is a very close and well-known relation of the Stinkwort.

A decoction of the root of the Elecampane was said by Dr. Withering many years ago to have cured sheep affected by scab. Elecampane was at one time largely used in medicine, but now its use is chiefly restricted to veterinary medicine.

How to get rid of it.—In discussing methods of eradication of Stinkwort (*Garden and Field,* April, 1894), it was agreed that vigorous measures should be used by everyone who had an interest in keeping the land clear, as those who had no experience of Stinkwort did not realise the immense loss which would accrue through allowing it to get beyond control. One gentleman intended to plough it under before it flowered. Another speaker thought such a course would be very dangerous, as ploughing would not destroy it,—indeed, stirring the land, he was afraid, would only increase its vigour. He was hoeing it, and found it effectual, although it might require several years hoeing to thoroughly eradicate it. He believed that hoeing before the plant flowered, as well as pulling up, which was better still, though more troublesome, was the only effective means of dealing with the pest.

This advice is clear and specific enough. Where it has once seeded it will not be got rid of in a year, and its eradication means more hard work for the farmer, who has quite enough work to do already. See page 308 of the May *Gazette* (1895).

Where found.—Countries round the Mediterranean Sea, from which it has spread to many warm countries.

Stinkwort in New South Wales.—As will be seen from the accompanying list, the pest has already got a footing in south-western New South Wales, as could have been confidently predicted. I do hope that our farmers will be able to cope with it, as it has been one of the most costly weed-pests to the South Australian farmer.

In April, 1889, I reported as follows to the Agricultural Society of New South Wales in regard to Stinkwort, specimens of which had been sent over from the Royal Agricultural Society of South Australia:—"To none of my correspondents nor myself is the plant known as having been introduced into New South Wales, though that is only a matter of time, probably short. Specimens of an *Inula* were sent to Sydney last year from southern New South Wales, suspected of doing injury to stock. Except by analogy, nothing is known of its properties here, but I do not for a moment believe that it is poisonous, although such a rank-growing weed, so full of fibre, would be highly indigestible, and the bitter would probably be very palatable to stock, especially to horses. The hyaline sticky resin is probably an interesting substance, common to many composites, but I do not think European chemists have worked at it, while Australian ones certainly have not. Species of *Erigeron* (cobbler's pegs) are almost as great a curse in parts of New South Wales as this species of *Inula* appears to be in South Australia, and no practicable plan appears to be known for the eradication of either."

In the *Herald* of 28th March, 1890, is the following telegram from Albury. It refers to Stinkwort:—"A noxious weed new to this district has been found in the paddocks near Burrumbuttock. It is said to be identical with the weed common in South Australia. It begins to grow in the summer months, has a straight stem, and grows (according to the nature of the soil) from 3 inches or 4 inches to 3 feet and 4 feet high. It is of a nice green colour, has small yellow flowers, and a very strong and nasty smell. It spoils all grazing land, especially for dairy cattle. The milk becomes green, with a very offensive smell, and the butter, after about two days, will give an unbearable smell."

Mr. G. S. Mackay, Secretary of the Albury Pastures and Stock Board, writes to the Department under date of 15th March, 1894: "Stinkwort has only lately made its appearance." In the *Gazette* of May, 1895, page 308, Mr. Odewahn, of Walla Walla, near Albury, reports it (the word *Inula* is spelt *Mula* through a typographical error).

It has made up for lost time since then. Up to May, 1917, the Stinkwort had been proclaimed by seven municipalities and thirteen shires, making twenty in all, and to date it stands fourteenth in the list of New South Wales weed-pests. Following is the list, furnished by the Local Government Department, of municipalities and shires that have proclaimed the weed:—

MUNICIPALITIES.

Albury
Balranald
Cootamundra
Corowa
Junee
Moama
Wagga Wagga

SHIRES.

Berrigan
Coreen
Crookwell
Culcairn
Holbrook
Illabo
Jindalee
Lachlan
Lockhart
Mulwaree
Murray
Narraburra
Wakool

The Cultivation of Agave sisalina.

E. H. HERON, Director of Agriculture for Mozambique Co., Beira, South Africa.

[The Under Secretary and Director of Agriculture has received the following report on the cultivation of *Agave sisalina* in Zambesia from Mr. E. H. Heron, who won his Diploma at the Hawkesbury Agricultural College in 1896. The article, while dealing with the industry in Zambesia, clearly indicates the limitations under which sisal hemp may be grown generally, and there would be considerable difficulty in undertaking its cultivation in this State for other than home use, while cheap land and labour were available in other parts of the world.—ED.]

THE original stock of this agave was obtained from cultivation in Yucatan, conveyed in 1834 to Florida and other parts of America, thence to all tropical countries.

Climate.

Agave sisalina is essentially a tropical plant, and can only be successfully grown in localities where intense heat for the greater part of the year prevails. The temperature should range between 24° C. and 38° C. in the shade with a sun temperature up to 48° C.; at the same time, occasional fresh breezes during the day and night tend to invigorate the plants.

Besides being hot, the climate during the greater part of the year should be dry; a country that has well defined wet and dry seasons produces the best sisal, taking for granted of course that the most suitable soil is selected.

The rainfall should be from 30 to 40 inches per annum, though sisal has, under certain conditions, been successfully grown where the rainfall is much smaller; a great deal depends upon the power of the soil to retain a certain amount of moisture and also on the continual cultivation of the plants.

By having distinct wet and dry seasons such as are encountered in most parts of Portuguese East Africa, especially near the Zambesi River, the sisal plants make enormous growth during the wet summer months, whilst in the dry winter season the whole of the cutting, extracting, drying and pressing can be successfully carried out without interference from irregular climatic conditions. In the dry period, from May to November, the percentage of fibre in the leaves is at its highest; a matter of considerable importance when so much hand labour has to be employed.

The following table has been taken from the records of the largest sisal plantation in Portuguese East Africa:—

	Percentage of Fibre in—	
	1st class leaves.	2nd class leaves.
May (half month)	3·1	3·4
June	3·1	3·5
July	3·4	3·5
August	4·1	4·2
September	4·1	4·25
October	3·8	4·1
November	3·2	3·81
Average for season ...	3·6	3·72

When estimating the production of the whole plantation a minimum average of 3·6 per cent. has been taken.

The percentages in the above table are taken from the amount of fibre actually extracted.

In the wet or growing season from November to May when the pulp in the leaves is surcharged with water the percentage of fibre is naturally low.

During the winter season there is a certain amount of growth, though it is not excessive; as with all cultivated plants their development largely depends upon the cleaning and working of the soil in the dry as well as wet seasons.

Soil.

Taking for granted that the climatic conditions are favourable the next most important point is the selection of the land.

As there is great diversity of opinion with regard to the class of land on which sisal can be successfully grown, the writer has based his observations only upon personal experience in East Africa, especially on the Zambesi River and the District of Quilimane. The area under cultivation on the Zambesi River is 650 hectares,* while in the district of Quilimane it is 3,350 hectares.

In Zambesi sisal can be most successfully grown on newly-cleared forest land above river level.

The ground should be as level as possible so that "Decauville lines" can be used in every part of the plantation for the transport of leaves to the mill. Hand transport for more than a very short distance is too expensive and slow.

The soil must be very deep and contain a fair amount of humus, a large percentage of sand, and a certain quantity of lime and other salts, principally lime and potash, which are absorbed into the tissues of the plants.

Gravel and small stones even in large quantities are of great advantage in keeping the soil compact, and assist in retaining moisture during dry seasons.

Perfect natural drainage is absolutely essential as nothing retards the growth of the sisal plant so effectively as stagnant water, either above or below the surface. A deep subsoil of gravel or stones materially assists the drainage of surplus water. A granite soil if sufficiently level produces splendid sisal, even though there may be occasional outcrops of large boulders. Land containing an impervious clay subsoil must be at all times excluded.

On some alluvial land sisal can be grown successfully, but the soil must be deep, of a loose sandy nature, and containing no clay. As a general rule alluvial soil cannot be utilised for sisal culture. This class of land in East Africa is always disappointing, the well-drained sandy alluvial which is found on the river banks invariably gives way to low-lying clay flats, which are utterly useless for the production of sisal.

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* A hectare is approximately 2½ acres.

Even on the best alluvial land it is, in the opinion of the writer, unsafe to plant sisal, the reason being that, though they may make enormous growth, the plants generally have a tendency to "pole" in the fifth or fourth year, and thereby lose two and possibly three cuttings, also the large production of suckers increases the cost of cleaning.

One hears statements by many that sisal requires a poor soil; this is a fallacy.

A heavy loam will generally give disappointing results, but on a really poor sandy soil there is very little development at all.

On no account should sisal be planted on old kaffir lands, or in fact any ground that has been continuously producing maize, mapira and more especially manioc.

On these lands the plants are never a success; they become stunted, the leaves turn yellow, and the percentage of fibre is small.

Good forest land especially cleared for sisal can produce fibre profitably for thirteen or fourteen years.

The Nursery.

Some months before the land intended for the new plantation is cleared a nursery must be laid down in a convenient spot as near at hand as possible in order to facilitate the transport of the young plants when ready for setting out.

The bulbils are planted during the wet season, preferably in a January or February; they must be placed about 50 x 50 centimetres apart in good soil and carefully attended to.

After 6 to 9 months when good healthy growth has been attained they are set out in the main plantation if the climatic conditions are favourable.

Bulbils must always be used. Although a certain amount of expense is incurred in making a nursery, the final results, under good conditions, are certain. The plants reared from bulbils can be depended upon to live the required time and "pole" with regularity, about six and a half years after transplanting from the nursery.

"Suckers" need no nursery; they can be taken from underneath the parent plant and at once set out in the plantation, thereby saving from six to nine months. But suckers are dangerous and should never be used, because they "pole" at the same time as the parent plant. For instance a number of suckers are taken from a three-year-old plant and set out in the plantation; the parent plant "poles" in the sixth year; almost at the same time the suckers, now three years old, will "pole" and die immediately afterwards. In this manner the whole profitable period in the life of the plant is lost, one cutting may be obtained, but no more.

Suckers will "pole" at about the same time as the parent even though growing many miles distant.

To lay out a plantation of 1,000 hectares a nursery of 2,500,000 bulbils is necessary.

All bulbils destined for seed must be obtained from the healthiest, strongest and best bearing plants.

Clearing.

The clearing of the land is done in the ordinary way; the stumps should be at once taken out to facilitate planting and working.

As the forest on land suitable for sisal in Zambesia is light, the whole of the clearing, extracting of stumps, stacking of firewood for working the mill, and final hoeing can be accomplished during one dry season.

The whole cost of preparing the ground to receive the young plants should not exceed £5 per hectare.

Laying out the Plantation

The plantation is now laid out in squares or rectangles, and roads marked out so that the Decauville lines when required can all converge conveniently into the mill. Next comes the alignment of the rows at 2·5 metres apart.

The planting out can be done at any time between the beginning of December till the middle of February according to the rains. This must be accomplished while the soil is thoroughly wet, but not in any way flooded.

The holes being ready beforehand the young plants must be brought quickly from the nursery near at hand and placed in the ground the same day, on the quincunx or alternate system.

The distance between plants in the row should be two metres, thus giving each plant five square metres, making the number to the hectare 2,000.

The cost of alignment and setting out should not exceed £1 per hectare.

During the next three years there is nothing to be done in the plantation itself except light hoeing to keep the ground clear of weeds and cut away suckers.

Unless the ground is systematically cleaned at least four times a year during these three years of important growth of agave the development of the plants will often become retarded to such an extent that the leaves will require an extra year before reaching maturity and one season's cutting will be lost.

Cutting and Harvesting the Leaves.

The cutting of the leaves can generally be commenced towards the end of the third year after transplanting from the nursery. The leaves must be of good length and weight and have a healthy appearance.

At this time a few of the longest leaves drop gradually from an almost vertical position towards the horizontal, at the same time the colour changes from a deep green to a yellowish green. This change in the position and colour gives the signal that the leaves are mature, contain the greatest percentage of fibre and are therefore ready for harvesting.

The fibre in the leaves at this stage is at its best and strongest and is more easily extracted and cleaned owing to the fact that the mucilage found in the green pulp has almost entirely disappeared.

Many plantations on which there are some hundreds of hectares that have to be harvested quickly in a given time often cannot wait till the above perfect state is reached, as soon as the dry season (May or June) commences the leaves that have the required length and breadth are generally cut and put through the machines.

After removing the sharp terminal spike the bottom leaves are cut as close as possible to the trunk by a trained native, another scrapes off the prickles on the edge of the leaves if raspador machines are used, while another loads into the trucks. The three natives can cut, dress, and load about one ton of leaves per day. Two natives can transport in trucks five tons of leaves per day to the mill.

A white man or an intelligent overseer must at all times superintend the cutting in order to select the first-class and second-class leaves.

As soon as a section of the plantation is ready for harvesting and the labour apportioned all the first-class leaves are taken off, the fibre exracted and the bales marked first-class, the remaining leaves are then cut, sent to the mill and the bales marked second-class.

In this manner the mill works economically and the best prices for the fibre obtained.

	Length	Average weight.	Percentage of fibre.	Percentage of leaves on each plant.
First-class leaves ...	1·50 to 1·80 metres ...	380 gr.	3·6	40
Second-class leaves...	All under 1·50 metres ...	250 gr.	3·72	60

It should be the aim on all plantations to produce as much fibre of 1·50 average length as possible, but not much longer.

Fibre of 1·50 metres is strong from end to end, but fibre of 1·80 and over has a tendency to weaken at each extremity.

Care must be taken not to cut too great a number of leaves from the plant in each season; this often causes weakness and the plant "poles" before the proper time causing a loss of one and sometimes two years' harvests.

On the other hand if the leaves are not cut at all during the life of the plant, "poling" takes place in the fourth or fifth year.

By taking off the correct number of mature leaves each season the life of the sisal plant is lengthened two, three and sometimes four years.

One great advantage of sisal culture is that if through neglect or lack of rain the leaves do not show sufficient development at the end of the third year after transplanting the cutting can be safely postponed until the following year.

In Zambesia under good conditions the harvesting of the leaves takes place in the third, fourth, fifth, sixth, and sometimes, though very rarely, in the seventh year.

Poling generally takes place with great regularity in six and a half years after transplanting from the nursery.

Average number of leaves produced per plant.

	1st Class Leaves.	2nd Class Leaves.	Total.
3rd year.... ...	37	58	95
4th ,, ...	28	42	70
5th ,, ...	22	30	52
6th ,, ...	18	25	43
Total... ...	105	155	260

Average weight per leaf 320 gr. Average percentage of fibre 3·6.

Extraction of Fibre.

The mill must be placed near permanent and good water, and in such a position that all Decauville lines can transport the leaves quickly and economically to the mechanical carriers or to the native feeding the machines.

The building must be made of strong brick and the foundations at least 3 feet deep of concrete to support the continual vibration of the extracting machinery.

The tanks for washing fibre should be made of cement.

Every mill appears to be built upon a somewhat different plan ; but for a plantation of 1,000 hectares and over an up-to-date building cannot be erected for less than £4,000, the extracting machinery, engine, press and pumps, etc., will cost approximately £3,000.

There are several different types of extracting machinery, these can be divided into automatic extractors and raspadors.

The cost of extracting the fibre altogether depends upon the engineer in charge of the mill, and also upon the plantation manager, whose duty it is to arrange that the correct quantity of it is delivered each day.

One necessity in the employment of raspadors is, that there must always be a staff of well trained natives to feed the leaves into the machines.

Up-to-date automatic extractors are being used on most plantations, two machines are necessary so that if one has to be stopped for temporary repairs the other can continue the work.

In a mill using raspadors the work need never stop, one or two machines being out of repair for a few days makes no appreciable difference.

Whether raspadors or automatic machines are used the cost of extracting spread over the whole season is about the same, both types require continual superintendence by a qualified engineer who must at the same time fully understand native labour.

Unless the leaves are put through the machines within about twenty hours after cutting, the cut ends become oxidised and fibre stained ; this considerably reduces the value.

Washing.

After leaving the machines the fibre is moved about in large tanks containing warm water until all the particles of pulp attached to the threads are washed off.

Clear water is always necessary ; should this be difficult to obtain at any time the following mixture will be found useful for clearing dirty water.

For every 100 litres :—

Quickline	6·8 gr.
Alum	20·4 „
Pot. Permanganate	0·28 „

These ingredients are placed in the water separately in the order above stated.

After washing, the fibre is dried in the sun, brushed and pressed in the usual manner.

The following estimate shows the quantity of fibre that can be produced from one hectare under good conditions in Zambesia :—

	Weight of Leav per Plant	Weight of Leaves per hectare of 2,000 plants.	Production of Fibre per hectare.
	Kilos.	Tons.	Tons.
3rd year	30·4	60·8	2·18
4th ,,	22·4	44·8	1·6
5th ,,	16·6	33·2	1·19
6th ,,	13·7	27·5	·99
Total	83·1	166·3	5 96

Cost of Production of 1 ton of Fibre.

This altogether depends upon the capital of the company, the management of the estate, and the price of labour.

Taking into consideration the interest on capital and amortisation, over the period of seven years, the cost of producing one ton of fibre on the estate should not exceed £14.

CODLIN MOTH.

EARLY in the year 1916 some publicity was given to the success that Mr. J. J. O'Brien, of Krawaree Station, in the Braidwood District, stated that he had had in the prevention of codlin moth from attacking the apple trees in his orchard. Some fifteen years ago, having suffered heavy losses by the ravages of codlin moth, Mr. O'Brien decided to try cultivation and sheep manure. Near the end of autumn he carefully removed the whole of the soil from the roots for a radius of 3 feet, and left them fully exposed to the influence of frost and rain. At the close of winter he spread three kerosene tinfuls of sheep droppings over the roots, and covered the whole with a layer of soil. Since then, he says, he has never been troubled with the moth in the case of the 3 acres of trees so treated.

The Under Secretary and Director of Agriculture decided that as the success apparently resulting from Mr. O'Brien's methods might possibly, and with considerable justification, lead to apple-growers neglecting to comply with the provisions of the Fruit Pests Act as regards spraying with arsenate of lead, a comparative test should be carried out in the orchards at Bathurst and Glen Innes Experiment Farms, and the reports in connection therewith are now available.

The Manager at Bathurst reports that six trees (two each of the varieties Buncombe, Alexander, and King of Tomkin's County) were treated as Mr. O'Brien stated, and the crop carefully inspected. Up to 28th December, 1916, 423 moth-infested apples were removed from the trees, and thirteen grubs were found in the bandages. Six similar and neighbouring trees that had been sprayed with arsenate of lead in the regular way were also under examination, and at the date mentioned ten live grubs had been found in the apples, and one in the bandages. The Manager concluded: "It is now considered time to abandon the experiment, and spray the trees."

The Manager of Glen Innes Experiment Farm confirms this opinion, and reported that the experiment was not a success.

A Descriptive Catalogue of the Scale Insects ("Coccidae") of Australia.

[Continued from page 140.]

WALTER W. FROGGATT, F.L.S., Government Entomologist.

SUB-FAMILY 4.—*Brachyscelinæ*, Froggatt.

THIS division of the Coccidæ contains the typical gall-making coccids, within which galls the males and females develop with the growth of the aborted woody tissue. In most cases the male and female galls are distinct structures, but in a few the males and females are found within the same gall. The active, flattened, oval larvæ attach themselves to the bark of the branch or twig, or to the surface of the leaf, and through the irritation set up the woody tissue swells up round them until they are perfectly enclosed in a box-like gall. There is usually an apical orifice at the anal extremity, but this opening may be on the upper or under side of the leaf.

The adult female is top-shaped, irregularly rounded, or elongate, sometimes attached to the inner surface of the gall, in others fitting closely into the gall chamber, but perfectly free and not attached to the woody tissue by the rostrum. The legs and antennæ are usually more or less aborted, sometimes wanting. While the members of the genus *Apiomorpha* only infest the stems and foliage of *Eucalyptus*, others are more general in their habits. The integument is often stout and leathery, clothed with fine hairs and rows of short spines on the apical segments of the abdomen, the anal segment produced into a pair, or a single chitinous tail.

These gall coccids were first noticed and described in the *Transactions of the Entomological Society of New South Wales* in 1862, by Mr. H. L. Schrader, but nothing more was done until 1892, when the writer published his "Notes on the Family *Brachyscelidæ*, with some account of their Parasites, and descriptions of new species" in the *Proceedings of the Linnean Society of New South Wales*, which was followed by four other papers in the series.

In the following year, Mr. I. G. O. Tepper published "Descriptions of South Australian Brachyscelid Galls" (*Transactions of the Royal Society of South Australia*, 1893). In dealing with Australian galls, Mr. E. H. Rübsaamen figured and described other species in the *Berliner Entomolog Zeitschrift*, 1894. In the *Agricultural Gazette of New South Wales*, 1896, Mr. C. Fuller described some species, and added to the list in the *Transactions of the Entomological Society of London*, 1899.

Genus XLII. *Apiomorpha*, Rübsaamen.

Berliner Entomolog Zeitschrift, Bd. xxxix, p. 204. 1894.
Brachyscelis, Schrader, *Trans. Ent. Soc. N.S.W.*, pp. 1–6. 1862.
„ Froggatt, *Proc. Linn. Soc. N.S.W.*, pp. 354–356. 1892.

The male and female coccids form distinct galls on the stems, twigs, or foliage of different species of gum trees (*Eucalyptus*). Male galls are more or less tubular, from which the males can emerge. Female galls form box-like structures containing an oval cell with a small opening at the apex; female coccid not attached to the gall, quite free within the gall, with the tip of the abdomen pointing upward to the apical orifice. Adult female turbinate or pear-shaped; epidermis smooth but wrinkled, clothed with fine hairs; short blunt spines along the hind margin of the segments on the dorsal surface of the abdominal segments. Mouth, legs and antennæ present but aborted; the anal segment furnished with a pair of hard thickened chitinous tails (anal appendages). There is no distinct anal ring, but a depression at the base of the tails in which is situated the anal opening. In all stages of their development they are more or less covered with a floury secretion. The male coccid is a delicate two-winged creature, with long, slender antennæ and long legs; abdomen slender, with a long white filament, twice the length of the whole insect, on each side of the tip of the abdomen. The larvæ are flattened, oval creatures with the margin encircled with a fringe of cilia; well-developed legs and antennæ. They are born inside the parent gall and emerge through the apical orifice.

In some species the galls vary, or specimens become aborted through the presence of inquilines, and this has led to some describers forming new species from an examination of the galls alone. The structure of the galls is very variable, but the specific characters of the adult females are very constant, and they can easily be determined.

The specific name *Brachyscelis citricola*, used by Schrader on page 3 in the paper quoted, is only a name and no species was described under it. so it is not placed in the list of species. Where Rübsaamen, Tepper, and others have named variable species from the galls alone, I have not treated them as sub-species because, while the galls may be aborted into different shapes, in a large series one can always get the typical form; the anal appendages and spines upon the dorsal surface of the thoracic and abdominal segments of the adult female coccid are constant. The specific name *ellipsoidalis*, Tepper, is only a name without any description.

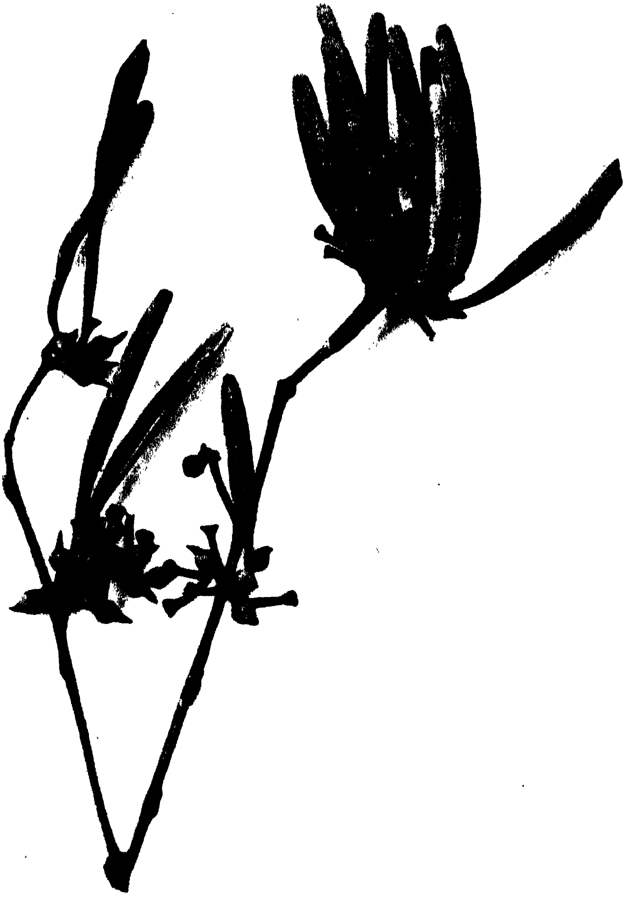
Apiomorpha attenuata, Froggatt.

Brachyscelis attenuata, *Proc. Linn. Soc. N.S.W.*, p. 375, pl. 8, figs. 5–7. 1898.

This unique species was described from a spray of flower buds of an undetermined species of eucalyptus received from South Australia, the exact locality being unknown.

Female gall spindle-shaped, slender at base, truncate at apex, springing from the flower bud on twig. Length, 1½ inches; greatest girth, ⅙ of an inch. Apical orifice circular, wall of chamber thin, chamber very long.

Adult female dull yellow, apex of fifth and sixth segments and anal appendages black, cephalic and thoracic segments oval, abdominal segments slender, tapering to the anal appendages, which are broad at the base, widely opening out in the centre, the cylindrical tails turned outward with a small spine on the inner margin near the tips; dorsal surface, abdominal segments constricted, third to sixth transversely barred with fine spines and fine hairs. Length, ½ inch.



Apiomorpha attenuata, Froggatt.

Male galls with the female galls, slender, cylindrical; apex bell-shaped, ¼ inch in length.

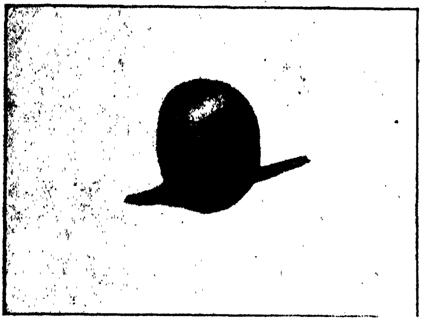
118. *Apiomorpha attenuata.* Cat. Coccidæ, p. 40.

Apiomorpha bäuerleni, Froggatt.

Brachyscelis bäuerleni, Proc. Linn. Soc. N.S.W., p. 369, pl. vii, fig. 4. 1892.
Apiomorpha bäuerleni, Rübsaamen, *Berl. Ent. Zeit.*, Bd. xxxix, p. 200, pl. xi, fig. 2. 1894.

Specimens were collected upon an undetermined species of *Eucalyptus* at Ballina, New South Wales.

Female galls firmly attached at the base in clusters of two or three, to the branches; broadly rounded, outer surface slightly ribbed, depressed on the summit; the walls consisting of a double shell, the outer thick and soft, inner one hard and thin, with often a slight cavity on either side of the rounded small apical orifice. Height ¾ inch, width slightly over ½ inch. Chamber broad, rounded, conical at apex.



Apiomorpha bäuerleni, Froggatt.
(**Female.**)

Adult female broadly turbinate, much wrinkled, short, abdominal segments coming to a point, fringed with fine hairs and a row of short spines; anal appendages black, short, thickened at the base, close together at base, slightly opened at tip. Length slightly over ½ an inch, and ⅓ of an inch across the centre of thorax.

Male gall unknown.

119. *Apiomorpha bäuerleni*. Cat. Coccidæ, p. 40.

Apiomorpha conica, Froggatt.

Brachyscelis conica, Proc. Linn. Soc. N.S.W., p. 365, pl. vi, f. 3. 1892.
Apiomorpha conica, Rübsaamen, *Berl. Ent. Zeit.*, Bd. xxxix, pls. xi and xiv, p. 209. 1894.
,, *similis*, Rübsaamen, *Berl. Ent. Zeit.*, Bd. xxxix, p. 210, pls. xi and xiv. 1894.
Brachyscelis regularis, Tepper, *Trans. Roy. Soc. S.A.*, p. 273, pl. iii, f. 3. 1893.
,, *subconica*, Tepper, *Trans. Roy. Soc. S.A.*, p. 274, pl. iv, f. 1. 1893.

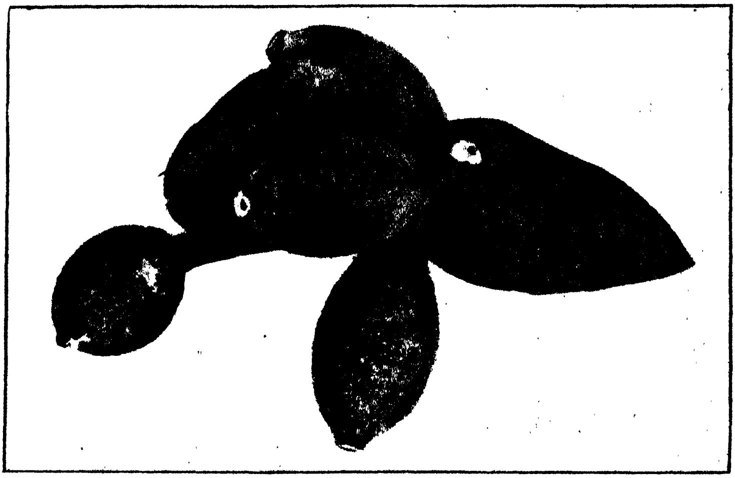
This species has a wide range; it is common on the foliage of *Eucalyptus viminalis* in New South Wales, and has been collected in Victoria on *E. gunnii* at Hamilton, *E. regnans* at Croydon and Mooroobunk (C. French, junior), and in South Australia on several undetermined species of eucalypts.

The female galls spring from a rounded base, singly or in clusters, on the branchlets, and are oval, rounded, tapering to a truncate annulated tip with the small circular apical orifice situated in a circular depression. The young female galls are often elongate and cylindrical, with the tip truncated and the apical orifice closed with a button-like cap that drops off as the gall matures and swells out. These elongate, slender galls, if found without the adult female galls, would never be considered as immature forms of this variable species. Length up to 1¼ inches, but variable in form and size.

Adult female broadly turbinate; cephalic and thoracic segments not much wrinkled; abdominal segments lightly clothed with fine hairs on the sides, a few scattered spines on the first, and a regular band of spines on the following ones; anal appendages short and blunt, deflexed outward at the tips. Length, ¾ of an inch; breadth, ⅛ of an inch.

Male galls tubular, slender, bell-shaped at the apex, springing out from the small branchlets, but sometimes on the leaves. Under ½ an inch in length, and about $\frac{1}{12}$ of an inch in diameter.

123. *Apiomorpha conica.* Cat. Coccidæ, p. 40.



Apiomorpha conica, Froggatt.

Apiomorpha cucurbita. Fuller.

Trans. Ent. Soc. London, p. 446, pl. xv, f. 13. 1899.

This coccid comes from Kimberley, North-west Australia, where it was collected upon *Eucalyptus uncinata.* I have never seen this species. The author says that when fresh the female galls are striped with white and green, resembling a small gourd.

Female galls smooth, hanging down, ellipsoidal, constricted at the base, the apex truncated, slightly dilated, with the apical orifice sunk at the summit in a slight depression. Length, 1¼ inches; greatest diameter 0·9 inch. Adult female not described. Fuller says that at first he considered it a variety of Tepper's *Apiomorpha regularis.*

124. *Apiomorpha cucurbita.* Cat. Coccidæ, p. 41.

Apiomorpha dipsaciformis, Froggatt.

Brachyscelis dipsaciformis, *Proc. Linn. Soc. N.S.W.*, p. 202, pl. xix, fig. 1. 1895.

The unique type specimen was sent on the twigs of a slender-leaved Eucalypt from Queensland by the Government Botanist to Mr. Tepper, of the Adelaide Museum, with no exact locality stated.

Female galls sometimes solitary, but in others clustered in groups of two or three, springing from a flattened button-like excrescence on the twig; dark, reddish-brown, oval, ½ an inch in height and about ⅓ of an inch in diameter. The whole surface to the rounded apical orifice covered with spiny bracts, turning downward like a small teasle.

Adult coccid pale yellow, broad, turbinate, clothed with fine hairs, thickest on the sides and forming a brush at the anal extremity. Legs short, with small claws; abdominal segments with a band of long slender spines and long hairs; anal appendages black, short, stout, cylindrical, divided in the centre and opening out at the tips, which are slightly pointed.

125. *Apiomorpha dipsaciformis*. Cat. Coccidæ, p. 41.

Apiomorpha duplex, Schrader.

Brachyscelis duplex, *Trans. Ent. Soc. N.S.W.*, vol. 1, p. 2, 1862, pl. ii, figs. A, h, l, o, s.
,, ,, *Verh. z. b. Ges. Wien*, p. 160. 1863.
,, ,, Signoret, *Ann. Soc. Ent. France*, vol. vi, p. 596. 1876.
,, ,, Froggatt, *Proc. Linn. Soc. N.S.W.*, p. 358. 1892.
,, ,, ,, *Natural Science*, vol. v, p. 111. 1894.
,, ,, ,, *Agric. Gazette, N.S.W.*, vol. ix, p. 490. 1898.

This remarkable gall springs directly out of the side of the branchlet of several species of eucalypts, and is not uncommon in the Sydney district and northward to Newcastle and in the Blue Mountains of New South Wales.

Female gall sessile, four-sided, swelling out into a green four-sided elongated ridged mass, variable in size but averaging 1½ inches in diameter and 2½ inches in length from the base to the apical orifice, which forms a narrow slit between the two flattened curled leaf-like horns, often 7 or 8 inches in length, that are produced on either side of the solid basal gall.

Adult female golden yellow, thickly enveloped in floury secretion and clothed with fine hairs. Somewhat flattened on the vertical surface, with rows of spines on the dorsal surface of the abdominal segments, together with tufts of long white hairs. Anal appendages long, slender, pointed, with three long hairs at the extremities pointing outward. Length of coccid, 1 inch; width at centre of thorax, ½ inch.

Male galls short, four-sided, opening out at the tips, springing from the leaves or on the horns of the female gall. Length, ¼ inch.

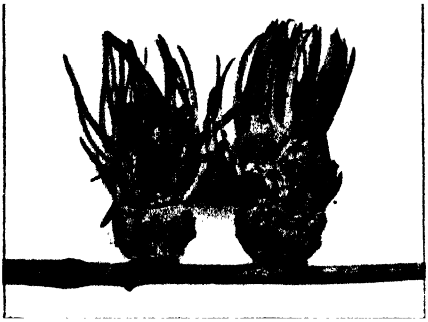
126. *Apiomorpha duplex*. Cat. Coccidæ, p. 41.

Apiomorpha excupula. Fuller.

Brachyscelis excupula, *Agric. Gazette, N.S.W.*, vol. vii, p. 217, pl. iii, figs. 4–7. 1896.

This species was first recorded from Port Stephens, New South Wales, on an undetermined species of eucalypt. I have had several fine series from the Tweed River, New South Wales.

This species was described and figured from the galls alone. Fuller gave no description of the coccid. I have retained his suggested name. Female galls often in masses on the branchlets of the gum tree, the basal portion not unlike the cup of an acorn, from which springs out the egg-shaped gall, the whole surface of which is covered with flattened slender tapering bracts forming a regular ring round the apical orifice, which is small and circular. Height of gall, about 1 inch; width about ½ inch.



Apiomorpha excupula, Fuller.

Adult female yellow, very broadly turbinate, with the tip of the abdomen coming to a fine point; thickly clothed with fine long yellow hairs on the sides of the lower abdominal segments, and forming a brush extending beyond the anal appendages. Antennæ very well defined, four-jointed; legs short and stout; the last thoracic and the first three abdominal segments with a few scattered reddish spines; fourth and fifth with longer scattered spines forming tufts on the outer margins: sixth small, with a large bunch of long spines and hairs on either side. Anal appendages bright reddish-brown, finely rugose, broad at the base, fitting into the centre of the last abdominal segment, with a central depressed line at the base, above which is a central saddle-shaped plate, then a narrow slit, then the tails come together and at the extremity open out at a V-shaped angle, blunt and rounded at the tips, arcuate on the outer margins. Length of coccid, slightly over ½ inch.

Male gall slender, slightly roughened tubes with no distinct expansion at the apex, but may be immature. Springing from the side of the basal cup of the gall. About ¼ inch in length.

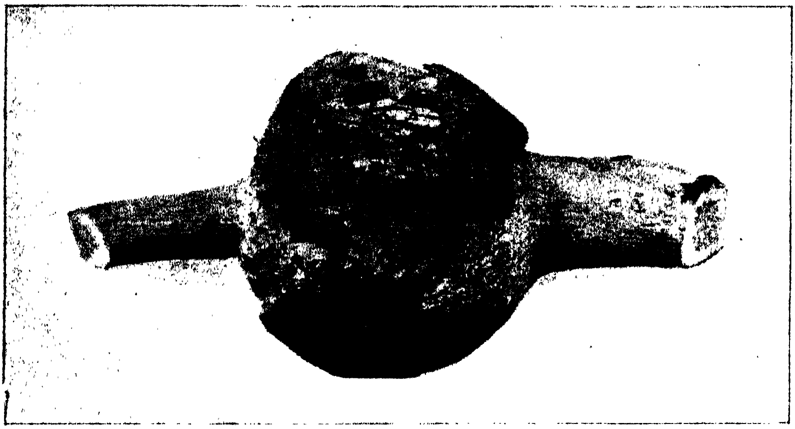
129. *Apiomorpha excupula.* Cat. Coccidæ, p. 41.

Apiomorpha fletcheri, Fuller. (Plate XXVII.)

Brachyscelis fletcheri, *Agric. Gazette*, *N.S.W.*, p. 215, pl. iv. 1896.
,, ,, Froggatt, *Agric. Gazette*, *N.S.W.*, vol. ix, p. 494. 1898.

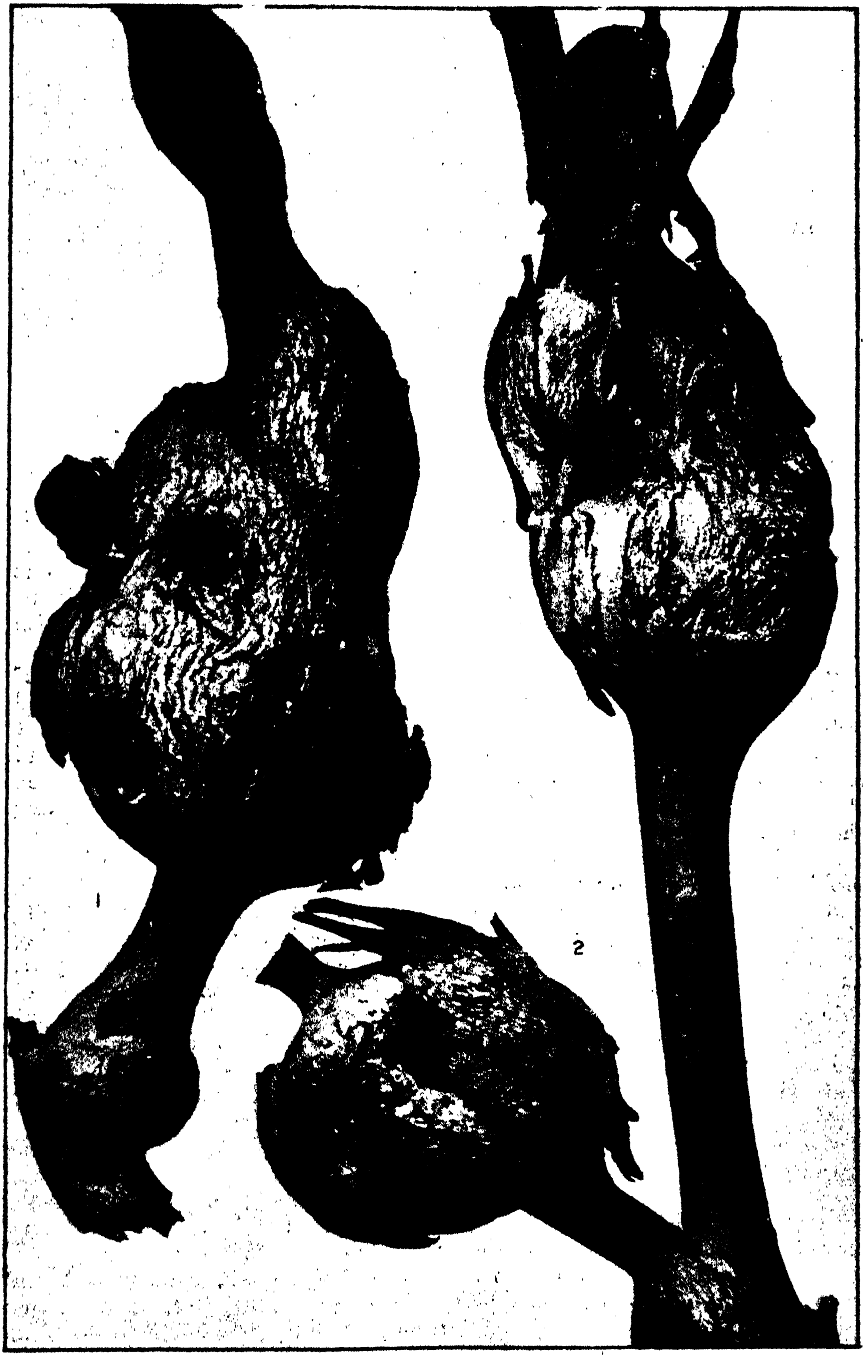
This species has a wide range. The types were collected in an undetermined eucalypt near Richmond, New South Wales. I have found it at Wagga and at other localities on the red gum (*Eucalyptus rostrata*), and at Hay, New South Wales, upon a box gum (*E. bicolor*). Fuller records it from Swan River, West Australia, on another gum tree, and French from Dandenong Range, Victoria, on *E. regnans*.

The females infest the branches, which swell out into aborted masses of tissue forming galls of all shapes and sizes, several inches in length, and broad in proportion. In these irregular woody masses the true coccid galls are embedded, usually hidden under the surface of the bark, but when the rough, dead, surface bark is pulled off, the apical tip of the upper half of the gall may be seen level with the surface or slightly projecting. The apical half of the gall, though it appears to be first formed of the bark, as the galls mature becomes a distinct funnel-shaped or conical cap, hard and solid with a very small circular opening fitting close against the upper rim of the lower half of the gall, which is a smooth white circular convex pit in the solid wood, in which the coccid rests, the tails reaching into the cap. Diameter of pit above, $\frac{1}{3}$ inch; depth of pit, $\frac{1}{3}$ inch; the cap portion of gall, $\frac{1}{3}$ inch. There are often three or four of the coccid gall pits in each woody mass, and the trees are often covered all over the branches with these woody excrescences.



Apiomorpha fletcheri, Fuller.
(Female.)

Adult female coccid dull yellow, with the apical abdominal segments and legs reddish-brown; the anal appendages black. Length, $\frac{1}{2}$ inch. General form elongate, turbinate, constricted at the apex of the thoracic segment, tapering to the tip. Antennæ and legs well defined. Dorsal surface covered with fine scattered spiny hairs, very lightly upon the thoracic portion, but



Apiomorpha fletcheri, Fuller.

SCALE INSECTS OF AUSTRALIA. PLATE XXVII.

thickly fringing the lower edges of the abdominal segment, smaller ones scattered all over the surface. Though having a stout base, all these seem to terminate in hairs and are not true spines. Anal appendages moderate in length, very rugose, with blunt spines along the sides, broad, the base opening out above, twisted and often turned over each other at the tips.

I have examined a large amount of material, and think this is a well-defined species distinct from *A. karschi*, to which it is allied.

131A. *Apiomorpha karschi fletcheri.* Cat. Coccidæ, p. 42.

(*To be continued.*)

"POULTRY FARMING IN NEW SOUTH WALES."

"POULTRY-KEEPING has fortunately passed the stage when one was continually met with the question: 'Will poultry pay?'" That it will pay has been amply demonstrated by the many who have succeeded in making it pay, and whose very existence in the business extending over many years is standing proof of that. But the evergreen question is: "How can one with little or no experience start and make it profitable?" To that it is the effort of the latest production of the Department of Agriculture to furnish the answer.

"Poultry Farming in New South Wales" is the title of a little book of 113 pages, into which are collected and condensed many of the articles and notes of the Poultry Expert, Mr. Jas. Hadlington. Practically every aspect of poultry farming is covered herein, from the selection of the site and laying out of the farm to the marketing of eggs and table poultry. Between those points lie all the problems connected with hatching and brooding the chickens, housing and feeding the grown birds, and maintaining the health and full productiveness of the yards. Of the number of these problems, readers of Mr. Hadlington's articles in the *Agricultural Gazette*, and of the Bulletins that are now out of print, have some idea. On nothing should they be more clear, perhaps, than on the importance of everything that contributes to the health of the birds—whether as youngsters, as layers, or as progenitors of next season's stock. Probably it is this very aspect of things that is hastening the day of specialisation in poultry farming; but let it be added that it is this self-same thing that is imposing on poultry-farmers the increased systemisation that sound methods demand. To the man already in the business no less than to him who is just committing his venture to fortune—to the keeper of thousands no less than to the keeper of a couple of dozen, "just to keep the house supplied,"—this publication is invaluable.

In the form of Farmers' Bulletin No. 108, a good deal of its information is already in the hands of many poultry-keepers, but copies of that issue have been unobtainable for some months. Opportunity was therefore taken of the need for a fresh supply to add much new matter, and to revise and rearrange other portions. The high price of paper, however, excluded the possibility of a reissue on the old terms, and the nominal figure of 1s. per copy had to be attached to it. The book can be procured from the Government Printer, Sydney, post free for 1s. 1d.

Poultry Notes.

JULY.

JAMES HADLINGTON, Poultry Expert.

As this month progresses a very decided increase should take place in the egg yield, and it follows that a corresponding reduction in the price of eggs must be looked for. This is a seasonable occurrence, yet it is not always realised, and some disappointment is felt when the prices of eggs are found to be nearing the 1s. per dozen mark towards the end of the month. A perusal of the figures for the corresponding months of other years will, however, confirm this.

However, the increased egg production will be most welcome in one other respect, in that it will enable incubating to be proceeded with to full capacity, a circumstance for which poultry-keepers who have been anxious to get an early start on have been looking forward to for many weeks past.

It may be as well to emphasise that July is the most valuable month in the year in which to set eggs, particularly of the medium and heavy breeds. Speaking generally, it can safely be said that, other things being equal, eggs set in July produce the most profitable stock. That is to say, that chickens hatched out from the last week in July to the middle of August make quicker growth, become larger and more vigorous breeding stock, and come in at a time when high prices are assured for good table poultry, while the pullets resulting from these early hatches are the most likely to be laying more or less consistently when eggs are dear in the autumn and winter months. A more general appreciation of these facts would result in poultry-farming becoming more remunerative than much of it is at present.

Unfortunately, there are some fallacious ideas abroad in regard to early hatching which deter many from starting early enough. One hears a good deal about not starting hatching until August, and, strange to say, there appears to be some confusion of thought in regard to hatching time and setting time; but the three weeks' difference is very material. It should be realised that for chickens to be hatched out early in August, even, say, at the end of the first week, eggs are required to be set from the middle of July. It will, therefore, be seen that unless a large number of eggs are got down in July, there will only be a small number of chickens out in August, after which another month (September) should bring the profitable spring hatching to a close. It is thus essential that no time be lost this month.

Brooding Chickens.

Both in these notes and in lectures I have sought to impress upon poultry-farmers that their success depends mainly on the ability to rear chickens successfully, that is to say, not only in regard to a minimum of losses, but also in securing good development. To this end it has continually been urged that expenditure on the rearing department of the farm is of much more importance than any other. The wastage in chicken life that takes place from neglect or inability to provide proper brooding and rearing equipment is responsible for hundreds of failures. True, many poultry-farmers have succeeded up to a given point, often with crude and improvised arrangements for rearing, but at what cost only those same farmers could explain. The writer, too, has been through this same mill, and can look back over experiences that he would never again attempt to repeat or wish others to go through, hence these warnings to beginners.

Good equipment is especially valuable in respect of these early chickens, and here the want of it is felt most severely. The weather in the spring is always variable, and often alternates from heat to cold, and it is only by having good equipment that we can secure anything like uniform conditions. This is where a good brooder house and well-heated brooders are of the highest value; without them chicken-rearing in large numbers during the early spring months is, to say the least of it, a precarious business. This plant is, of course, somewhat expensive, particularly with materials at present rates; but when it is considered that the materials for a good brooder house and, say, eight to ten brooders can even now be purchased for the value of, say, 1,200 to 1,500 chickens, there is no question as to the wisdom of the initial outlay when it can be managed. It is not overstating the case to say that hundreds of individual poultry-farmers lose more than that number in a single season for the want of these things, and many repeat the process year after year.

ints on Brooding.

The first essential for successful brooding is a properly constructed brooder house. There is a right way and a wrong way of building one; the latter is unfortunately only too much in evidence, even where sufficient money has been spent to have ensured a good building. Mistakes of this kind arise both from the want of knowledge and from a desire to have something different from anything else in existence—a weakness that is all too prevalent among poultry-keepers.

A Good Brooder House.

Following are the dimensions of a serviceable brooder house:—Any length up to 60 feet; height, 7 feet at the back and 9 feet at the front; width, 13 feet or 14 feet, according to whether it is desired to have a 3 feet or 4 feet passage at the back of the brooders. A width of 2 feet should be allowed for the brooders and 8 feet for inside runs. A desirable length for brooders is 4 feet, which will regulate the width of the inside runs to that measurement. The best aspect for the brooder house in any normal position is facing east. It should also be closed in on all sides, with a door to give ingress opposite the passage running at the back of the brooders, and should have windows front and back. Outside runs of about 18 or 20 feet in length should run out from the front of the building, facing east. The walls might be constructed of lap-and-space hardwood sawn palings, with weatherboard to fill up the inequalities above the palings to the roof in the ends. Such a brooder house is illustrated on page 21 of the forthcoming sale publication, "Poultry Farming in New South Wales."

Principles of Brooding.

Apart from the class of brooder in use, there are a few general principles which constitute successful brooding. The first is that only chickens of one age should be run in the same brooder. Any attempt to run different ages in the one brooder compartment will spell ruin to the younger ones, even if there is only a difference of a few days in the age. A brooder to be successful must be capable of being heated up to 90 degrees Fahr. when empty, and it should not be necessary to close up the brooder with the chickens in it to maintain sufficient heat, although it may be necessary to close up the empty brooder to get it up to that heat in the first place, and until the wood has become thoroughly heated through. Another condition is that an aperture should be left the whole length of the brooder and about 4 inches high, before which a curtain of slitted felt or flannel should hang. This will allow of all the chickens being able to congregate to the front of the brooder should the heat become too great, and also ensures fresh air being available to every chicken in the brooder. To allow of this a good heating apparatus is absolutely necessary. A brooder that has to be closed up with the chickens in it in order to get sufficient heat often proves a death-trap, and is almost sure to cause not only sickness but a weak development.

A brooder to accommodate 75 to 100 chickens will require to contain 8 square feet of space, and I prefer this to be oblong in shape, 4 feet x 2 feet. This size will accommodate the number mentioned for the first week or two, when they will require to be thinned down to about sixty. I prefer thinning down in this way to having larger brooders, as the latter are not so easily kept cosy for the baby stage. The floors of the heated compartments should be covered with some kind of non-absorbent material loosely laid in, so that it can be taken out once a week and washed with a disinfectant. This is necessary to preserve the wood from contamination. The bottoms should also have sharp sand thrown over them to keep the excrement from adhering to the bottom; this saves labour in cleaning, and is otherwise beneficial to the chickens

Heat Required.

The brooders should stand at 90 degrees to receive the chickens, and when they are put in a careful watch is necessary to see that the compartment does not become too hot. The temperature mentioned should be maintained during the first week; after that it should be reduced a few degrees during the next two weeks, and lowered again as they get older, until they are hardened off to do without heat at five to six weeks in cold weather and four to five weeks when warmer conditions prevail.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Albury.

A meeting of the branch was held on 4th June, when Mr. T. H. Patterson, H.D.A., delivered a lecture to a large audience.

ORGANISATION IN AGRICULTURE.

Mr. Patterson outlined the extent to which agriculture was organised in other countries, particularly in the United States, where agriculture had probably received greater attention, and the agriculturists better inducements, than in any other country.

In comparing the producers' environment in the bush with the dweller in town and city, Mr. Patterson said the producer and his family toiled long hours (Sundays included), in many cases far removed from the society of his fellows, and in the isolation of the bush. The producer of wealth, who follows the oldest and most august of callings, had to toil away in seclusion, and get only a small percentage of the fruits of his labour. The germ of all social and economic life was in the soil, and the farmer called into being the life and activity of practically all industries.

Taking the case of fruit, the lecturer remarked on the general complaint that this product, necessary for the health of the people living in a warm climate, was too dear. Our climatic conditions favoured the production of fruit, but our system of handling was wrong. From the producer to the consumer there seemed to be a great deal of unnecessary handling, whereas co-operation on the part of producers would ensure a great reduction in price. The producers of fruit did not get even a fair profit, while the consumers paid dearly for the fruit. This could be righted by a strong organisation of fruitgrowers. A local co-operative body in each district could use surplus fruit in a co-operative canning factory, or turn it into pork, which, again, could be handled by a co-operative bacon factory. Apart from its educational advantages and its social benefits, co-operation would reduce the cost of the transport of manures, machinery, products, &c., freights and commissions would be reduced, while the producer himself would benefit. In Ireland the system of co-operation in dairying introduced by Sir Horace Plunkett increased the farmers' profits from 30 to 40 per cent., due mainly to improved methods brought about by co-operation with the Technical Education and Agricultural Departments, and to the reduction of expenses by cutting down freights, commissions, &c. In Denmark the co-operative system was introduced in 1882. At present there were over 1,000 co-operative dairies, with 150,000 members, who owned 70 per cent. of the cows in Denmark. In conjunction with the dairies, societies sprang into being for the sale of butter, while co-operative bacon-curing establishments handled pigs. Cheese factories on the co-operative system also followed.

Germany, just before the war, had increased her production to double that of Great Britain, mainly owing to organisation in agriculture. In Germany the chief agencies for lending money on real property were the Land Mortgage

Credit Association and the savings banks. When a farmer desired a loan from a mortgage credit association, his estate was valued by experts, and inquiries were made respecting his business capacity and skill as an agriculturist. Thus the credit system reacted on the technical skill of the agricultural population. In times of depression, when money was difficult to raise, the reputation of a landowner as a business man might secure him an advance where otherwise he might fail. The working capital on the small German farm was usually provided by short loans from popular village banks, which lent only to members. Like most other German credit associations, they were cheaply managed. About one-fourth of all the manures and feeding stuffs used on German farms was bought through co-operative societies.

After the war of 1870, France set herself to organise agriculture. She started at the beginning by making agriculture a compulsory subject in her schools.

If this country of such potentialities was to be held, we must raise the quantity and quality of every sort of useful production to the maximum, and reduce the cost of creation and distribution to the minimum. To do this, the first essential was education. The encouragement given to agricultural education by Nature study in the primary schools, the establishment of Agricultural High Schools, and the inauguration of the crop competitions amongst the school boys of the State, which prepared them for our Agricultural Colleges, in which a sound, practical and theoretical training was given to students, was a step in the right direction. It was starting with the young, who were without prejudice. As an additional incentive, a plot of land might be given to each boy who obtained his diploma at the Agricultural College. This system of tangible reward to the graduate of the Agricultural College was in operation in Canada. The Faculty of Agriculture at the University will train our experts who wished to take up specialised work, such as plant-breeding, &c.

The Agricultural Bureau was a valuable movement that was doing much for agriculture. Branches of the Bureau could now obtain from the Principal Librarian in Sydney sets of books to the number of thirty, while the Department was ever willing to arrange lectures and demonstrations by its experts, so far as staff limitations would permit. Branches could, with advantage, make each their own local collections of plants, good and bad, and of insects, beneficial and injurious.

The annual meeting of the branch was held the same evening, the Chairman (Mr. F. Wells) presiding.

The balance-sheet showed a credit of £9 17s., with £5 7s. Government subsidy to come.

The election of office-bearers resulted as follows:—Chairman, Mr. F. Wells; Vice-Chairman, Mr. J. Fleming; Treasurer, Mr. H. Hague; Hon. Secretary, Mr. J. Brann. Messrs. J. Wignell (Thurgoona) and H. Hague (Lavington) were appointed correspondents.

The Librarian of the Public Library of New South Wales wrote stating that sixty books on agricultural subjects would be forwarded every four months, carriage free, provided that two members would guarantee that the books would be returned in good condition. The idea of a circulating library was considered a good one, and Messrs. Wells and Hanna agreed to their appointment as guarantors for the books.

The members unanimously agreed to vote £1 as a third prize for the Schoolboys' Farm Crop Competition recently inaugurated at Albury District School.

Bimbaya.

A lecture on dairy hygiene was delivered by Mr. Matthew Wallace, Dairy Instructor, on 10th May, when there was a good attendance of members, and a discussion followed, in which a lively interest was shown in the subject.

DAIRY HYGIENE.

Mr. Wallace pointed to the advances made in the various operations of the dairy farm, mentioning particularly the processes of separation, pasteurisation, and testing milk and cream. Just as science had served the industry in these respects, so it also served such other important interests as the health of the cow, and the health or keeping quality of dairy produce. The title that the branch had chosen for his lecture might just as easily have been more homely, though less imposing—"Dairy Cleanliness." The close relationship between cleanliness and health made the former more important.

Most diseases were due to bacterial origin and were the result of direct contact with the source of infection, such as animals which were themselves suffering from disease or which acted as carriers, though apparently not themselves suffering to any extent from the disease. The predisposing cause was low vitality (which might be due to poor condition or the result of an accident) and a consequent lessening of the natural powers of resistance.

One of the most dread diseases affecting both the bovine and the human race was tuberculosis, which was said to be communicable from animals to man. Fortunately the open-air life of the cattle in this country greatly assisted in keeping it in check. Every suspected animal should not only be at once discarded from the dairy, but segregated from the other cattle, and where positive evidence of this disease existed the animal should be killed and burnt or buried in quicklime. The practice of feeding such carcases to pigs could not be too strongly condemned. The feeding of uncooked carcases to pigs was an offence under the Pure Foods Act.

The provision of sufficient good food and clean drinking water, coupled with sanitary conditions in the cowyards and bails, was perhaps the best insurance against disease.

Like all other organisms, bacteria must have food, heat, and moisture in order to live and reproduce their species; in other words, they must have suitable conditions to work under, and their rate of increase depended on the presence or absence of these conditions. Unlike most other organisms, in order to get their food they must get into it, and they throve best when a large amount of moisture was present.

Some bacteria were man's enemies and some his allies. Some caused disease, while others performed useful service in various industries and manufactures, and also assisted in combating the effects of the disease-producing germs in the animal system. Others again, while not actually producing disease in men or animals, produced disease in food products such as milk, butter, and cheese. These belonged to the various classes which caused putrefaction and gave rise to trouble in the factory. They were generally found in great numbers associated with anything of a decaying nature, and herein lay the absolute necessity for preventing anything of this nature in the vicinity of the dairy. Many of these putrefactive bacteria normally lived in the intestine of the cow; hence the danger of contamination from cow manure.

It might be deduced from the above that the principal aim of the dairyman should be to keep in check those germs which were harmful, just as he tried to keep down those weeds which were destructive to his crops, and thus make the conditions favourable for the growth of those which were of service to him in the treatment of his dairy products.

There were many agencies by which germ life was spread, but the principal avenues by which an entrance was gained to milk and dairy products were—through dust from and around the cowyards, the use of impure water for the washing of dairy utensils, neglect to clean the udders of the cows and the hands of the milkers, unclean milking machines, or flies having access to buildings or vessels in which milk or cream was kept.

The factors which controlled the growth and activity of bacteria were—heat, cold, the presence of moisture, chemicals (*i.e.*, preservatives and antiseptics), drying, and sunlight.

High temperatures maintained for a sufficiently long period would destroy all organic life, and if the substances thus treated were then kept from the air, no change would take place for an indefinite period.

Low temperatures retarded the growth but did not destroy organic life, hence the reason why foods held in cold storage changed very slowly.

Chemicals might be divided roughly into two classes—preservatives and antiseptics. The former included common salt and boracic acid. These had an inhibitive effect on bacterial life, and could be used in small quantities to preserve foods which would otherwise quickly decompose. Antiseptics were more powerful in their action, and could not, therefore, be used to preserve foods, but were invaluable for disinfecting floors, walls, &c. Carbolic acid and quicklime were both good antiseptics.

The presence of moisture was essential for the propagation of germ life, and food substances which could be dried, thereby having their moisture contents reduced, did not readily decompose. Cheese and dried fruits were examples of food preserved by the reduction of moisture, though in the former instance a preservative had to be added and pressure applied, as the article would be unpalatable if all the moisture was extracted.

Direct sunlight was fatal to bacteria, and formed Nature's principal disinfectant, and this was a fact worth remembering when it was stated that the pathogenic or disease-producing bacteria throve best in dark, badly-ventilated recesses, away from fresh air and direct sunlight. Underground drains which had become partly choked, or dark corners where decaying matter was allowed to accumulate, formed admirable breeding grounds for disease.

The practical application of hygiene in the dairy should aim at securing, as far as possible, such conditions in the yards, cowbails, and other adjuncts of the dairy as would prevent the growth and propagation of germs injurious either to the people, the cattle, or the products of the dairy. All bails, yards, calf-pens, and pigsties should be so constructed that they could be easily cleaned; no manure or other refuse should be allowed to accumulate near the dairy, and all buildings should be regularly lime-washed. All buckets and strainers used should be thoroughly washed and scalded every time they were in use, and the practice of feeding calves from the milking buckets was strongly condemned. Too much attention could not be paid to the strainer; this was frequently a very weak link in dairy management, and unless attended to would undo the best efforts in other departments.

The law required all those engaged in the production of milk or dairy produce to maintain their persons and their clothing clean, and there was probably no regulation of the Pure Foods Act less observed than this one; indeed, it was the exception rather than the rule to find milkers regularly washing their hands while milking.

The practice of washing the separator only once daily required discouraging. Combined with the use of dirty clothes or strainers, and the neglect to keep the hands clean while milking, this was responsible for more inferior cream being produced than all other causes put together.

The proper management of cream, especially during hot weather, demanded more care than was usually bestowed on it. There were still to be found dairymen who separated all cream into the same can, and who neglected either to cool or to regularly stir cream before delivering it to the factory. Cream should always be separated into a separate can and never mixed with the cold cream until cooled. The rod used for stirring should be of tinned metal. Wood absorbed the fat and was apt to impart a tallowy flavour.

Such faults as slimy cream, fishy butter, or gas in milk used for cheese-making, were caused by the introduction of germs of putrefactive nature from some of the sources named, and did an infinite amount of harm to the butter and cheese produced.

Fairfield.

At the May meeting of this branch, Mr. F. Lawton gave a lecture and demonstration on the castration of pigs. An effort is being made to induce residents of the district to take a greater interest in the work of the branch.

French's Forest.

A meeting was held on 26th May last, when a discussion took place on manures and manuring. Mr. George Haigh was elected Vice-Chairman in place of Mr. Barnes, who is leaving the district.

Garra and Pinecliff.

A meeting was held on 7th instant, when there was a fair attendance of members. After the general business had been disposed of, arrangements were made for a pruning demonstration by the Assistant Fruit Expert, which is to take place at an early date. The members greatly appreciate the box of books sent from the Public Library.

Glenorie.

A meeting was held on 1st May, when a discussion took place on the proceedings of the conference held in Sydney during the Easter holidays. The question of taking part in the commencement of a co-operative jam factory was also considered.

Holbrook.

A meeting was held on 12th May, at which Mr. E. Breakwell, Departmental Agrostologist, delivered a lecture before a good gathering.

PASTURE GRASSES.

Mr. Breakwell divided grasses for the purposes of pasture into two broad classes—native and introduced.

The introduced grasses, such as Rye grass, Cocksfoot, and Prairie, were used for pastures on the Coast and Tablelands, but the climate of the interior, including that of Holbrook, was against the successful cultivation of these three grasses. Adverse summer conditions (drought and hot summer spells) soon killed them out. The newer introduced grasses, like *Phalaris bulbosa*, Paspalum, Rhodes and Sudan grass, would all grow successfully under normal conditions, but would only produce pastures for a certain period of the year. At Wagga Experiment Farm, experience had been obtained with these grasses that enabled the following remarks to be made:—

Phalaris bulbosa was the best winter and most succulent grass yet introduced in those parts. It was necessary, however, to have the real strain of the permanent form, as there was a good deal of the annual *Phalaris minor* on the market. This annual grass made a prolific growth in the winter and spring, but soon died out with the summer heat. It had spread all over the State, and in many parts produced good succulent feed during the cool months. The permanent form, *Phalaris bulbosa*, was very similar, except for the head, which was longer and more tapering than that of *Phalaris minor*. It could be sown in the autumn, at the rate of 8 to 10 lb. of seed per acre, through an ordinary wheat drill. The earlier in autumn this grass was sown the more strongly established it would be in the spring to endure summer conditions. Great care should be taken in pasturing this grass, as both sheep and cattle would eat it down to the roots if allowed to remain too long on it, but under judicious management the grass could be recommended to give profitable returns.

Paspalum, although providing a certain amount of feed in the spring, could hardly be recommended as a permanent pasture for those parts, except for low-lying lands. It was so partial to hot, moist conditions that the dry summers of Holbrook could produce little or no growth, and of course the flag died down with the winter frosts. Better returns should be obtainable from Rhodes and Sudan grasses. Rhodes grass should be sown in the spring, about late September or early October, at the rate of 3 lb. of seed per acre. The seed would run through the drill, if mixed with sand or similar earthy matter. The grass should not be stocked until the creeping stolons were established. Judicious stocking would be required, and it should be allowed to seed periodically. The grass was a palatable and nutritious one.

Sudan grass was an annual summer grass, and was only suitable for hay or soiling. It was a remarkably rapid grower, most succulent, drought-resistant, and a very free seeder. It also responded well to fertilisers. It might be strongly recommended for Holbrook. Sow 10 lb. to 12 lb. seed per acre in drills about October.

Amongst the grasses growing wild on cultivated and uncultivated lands in Holbrook district the following were mentioned:—Barley grass, Brome grasses (*Bromus maximus, B. mollis,* and *B. racemosus*), and Rat's Tail Fescue. The trefoils (*Medicago denticulata, M. lacinata, M. minima,* and *Trifolium glomeratum*) also constituted a large percentage of the pastures. Barley grass was so very firmly established that it would now be extremely difficult to eradicate. It could not be recommended as a pasture grass, for though it produced a fair amount of feed in winter and spring, it dried down quickly on the approach of summer. Then the nutriment was practically nil, while the sharp spear-like seeds often gave trouble to the eyes and mouths of stock. Much better results could be produced from *Phalaris bulbosa,* or even the annual *Phalaris minor.*

The Brome grasses introduced from Europe were also annual grasses. The flag, which grew well in winter and spring, was not nutritious, while the free-seeding propensities of the grasses allowed them to spread over all classes of land, crowding out other more nutritious grasses and plants.

Rat's Tail Fescue was an annual grass producing a certain amount of palatable flag in the spring months, but it soon died off, only to come up again thickly in the autumn.

The trefolis were, of course, nutritious plants, and could be highly recommended as fodder.

Prominence was given to the *Danthonia* grasses, commonly known as Wallaby or White Top grasses. These grasses were amongst the most common, and at the same time the most valuable, in the State. They were excellent sheep grasses, and provided feed throughout the greater part of the year. If judiciously stocked, they would provide a permanent pasture extending over an indefinite period of time. They were very free seeders, and experiments conducted in a specially regulated germination chamber made at the Botanic Gardens indicated that at a temperature as low as 65° F. the seed would germinate to the extent of 50 to 70 per cent. This meant that in a climate like that of Holbrook the *Danthonia* grasses should begin to shoot in September. Advantage should be taken of the seeding periods of these and other grasses in stocking. In a pasture that was partly denuded of these grasses the stock should be removed from the paddock during the period the grass was flowering and turned on again when the seed was mature. By this means the seed was well trampled into the ground, to germinate when suitable rains arrived. To introduce this grass into a pasture much could be done by scattering the seed in September. It would readily germinate during that month, and help to increase the stand of grass.

Similar methods of stocking could be applied to other valuable native grasses, such as the *Chloris* family (Star or Windmill grasses), the Panic grasses, and the *Andropogon* or Blue grasses. The principal *Chloris* grasses growing in the vicinity were *Chloris truncata* and *Chloris acicularis,* both valuable sheep grasses. The Panic grasses, including *Panicum gracile, P. flavidum, P. prolutum,* and *P. effusum* were all good summer grasses, but unless allowed to seed, would soon disappear under stocking. The principal *Andropogon* grass about Holbrook was *Andropogon pertusus,* a red-stemmed grass, producing a good flag in the spring and summer months of the year. The grass was best appreciated in its young stages, but did not appear to be relished so much in stalk. The time for laying down cultivated native pastures had not yet arrived, but much might be done by scattering seed of native grasses adapted to the vicinity.

Such grasses as Coolah grass (*Panicum prolutum*), Warrego Summer grass (*Panicum flavidum*), Australian Millet (*Panicum decompositum*), and Satin Top grass (*Andropogon erianthoides*), all did well at Wagga, and should thrive near Holbrook. They were evidently drought resistant, and the great advantage attaching to them was the fact that they throve in the summer when the herbage and introduced grasses had died down. No introduced grass would produce as good results as native grasses in the interior. The rapidity with which the seed germinated, the rapidity of growth, the drought resistance, and their nutritive qualities rendered them superior to any herbage or introduced grasses, which were so common in the cool months, but which were so likely to strangle the native grasses unless the latter were encouraged.

Kellyville.

There was a good attendance of members at the meeting held on 3rd June. A discussion took place on the questions of co-operation, jam-making, &c., and the Chairman, Mr. H. Reid, read a paper, from which the following paragraphs are taken:—

AUTUMN BLOSSOMING IN DECIDUOUS TREES.

We very often see, even in young trees, an autumn blossoming that tends to lessen the chance of a full summer crop. What causes the tree to send forth this growth or flow of after-season sap? It is a question every grower must settle himself. He should examine the tree to see if it is infested with San José scale, or if it is free from borers. He should also be satisfied the soil is open and sweet. Observe whether the subsoil is allowing the water to drain away quickly enough. Most of all, stone fruits cannot stand the subsoil to become soddened.

If the grower is satisfied that none of these things is the cause, he must ask himself if he has not been too anxious and overloaded his trees. In most orchards that I have watched this has been the principal cause. I would recommend the following simple points to any grower whose trees are in the habit of blossoming in the autumn. Be sure to keep the trees healthy and free from all fungus growths, keep all dead wood cut out, give careful pruning, not leaving excessive wood in trees that usually give regular crops. In peaches and nectarines leave as little two-year-old wood as possible for the next year's crop, preparing the strongest wood and working out the slender shoots wherever possible. It is better to give the tree a year of light cropping than to allow it to carry too great a crop, for this only tends to give an inferior grade of fruit. Where stone fruits have not received the best of treatment, do not cut too hard the first winter. Cut light if they are aged trees, and spray with lime-sulphur. See that the cultivation is good, also give a few pounds of bone-dust if other manure is not obtainable. The second year there should then be new wood to work on when pruning. A somewhat similar treatment can be applied to plums, the difference being that most plums bear their fruit on two-year-old-wood.

We also find apples and pears throwing out blossom in the fall of the season. Trees of these kinds soon become exhausted from over-cropping. Do not let the tree carry an excessive crop. If you have taken out sufficient wood, then thin out the fruit, preferably leaving the single fruit instead of the bunch. A better grade is obtained by leaving the single fruit in apples or pears. Never leave the fruit-wood too congested; distribute it well up the main leaders. This will give a better chance when spraying to get at every flower. When pruning leave only two-year-old wood. Better crop results come from two-year-old than three-year-old wood. As the tree ages never let either apple or pear pass the winter without a careful pruning. I have always found the best results come from a regular lightening of the old wood. This ensures a regular growth of new wood to cut at.

I notice orchards where a patch is often left unworked, this being done for the cow or pig to get feed. The soil is then worked till the moisture has all dried out. This is a foolish thing to do. Better reserve a patch, and grow suitable crops than rob the fruit-tree of its only chance, for if the winter moisture once dries out, the tree receives a shock, and may not recover until the fruit has been gathered. Then the first shower causes the sap to move and the result is autumn blossoming.

Lower Portland.

Subsequent to the Horticultural and Agricultural Show which was held by the branch on 8th May last, the branch entered a bureau exhibit at the Hawkesbury District Agricultural Association's Show at Clarendon on 10th, 11th, and 12th May. There the exhibit took the second prize of £3 3s.

Middle Dural.

A pruning demonstration was given by Mr. W. le Gay Brereton at Mr. George Best's orchard on 25th May. The annual meeting and election of officers took place on 1st June.

Mittagong.

At a meeting held on 12th May it was decided to place before the Berrima District Agricultural, Horticultural, and Industrial Society at Moss Vale a proposal that at the next Show there should be a class for competitive exhibits from the Agricultural Bureau.

Captain Fairley gave a demonstration in knotting, and in long, short, and eye-splicing of ropes, and he also showed the uses and application of each in relation to farm work. Several of the senior boys of the Farm Home at Mittagong attended. Captain Fairley's demonstration was very much appreciated by members.

Parkesbourne.

The annual meeting was held on 12th June, when the following were elected as office-bearers:—Chairman, Mr. W. H. Weatherstone; Vice-Chairmen, Messrs. C. Apps, H. Bastin, and G. Brown; Treasurer, Mr. J. Brown; Hon. Secretary, Mr. S. W. McAlister; Assistant Secretary, Mr. H. S. Grunsell.

The Secretary states that the branch is in a flourishing condition, with a good membership roll, and as it has ample funds, it was decided to forego the subsidy.

Mr. G. Brown gave a demonstration of the use of the hydrometer in testing the strength of lime-sulphur spraying mixtures of different qualities.

Rawsonville.

A meeting was held on 30th May, which was attended by thirteen members. A discussion took place on the subject of feeding farm horses.

Robert's Creek.

The monthly meeting of this branch was held at Mr. Watt's residence on 2nd May. There was a good attendance of members, and a large number of visitors were also present. Four new members were enrolled.

The evening was devoted to a debate on the aims and methods of the Agricultural Bureau and Farmers' Union. The business for the next meeting is to be a lecture on first-aid to injured stock.

Spencer.

A meeting was held on 19th May, which was chiefly devoted to a discussion on fruit-growing.

The subject of co-operation occupied attention first. Mr. J. Bushell, who was one of the delegates to the conference of fruit-growers, related what had been done in Sydney at Easter. Subsequently a discussion took place on the question of an import duty on foreign fruit.

Springside.

A branch of the Bureau has been formed in this district. Twenty-four members have already joined, and there is every prospect of the branch becoming an important factor in the agricultural life of the district.

St. John's Park.

The annual meeting was held on 18th May. There was a large number of members present, and the election of officers resulted as follows:—Chairman, Mr. F. Gava; Vice-Chairman, Mr. D. Murchison; Treasurer, Mr. T. Hunt; Auditors, Messrs. M. T. O'Flynn and J. Willian; Hon. Secretary, Mr. J. C. Scott.

The balance-sheet showed a credit balance of £3 5s. 6d., and it has been decided to purchase shortly a number of books for the branch's library.

Tallong.

A branch of the Agricultural Bureau has been formed at Tallong. Twenty-one members have so far joined, and Mr. W. Snushall has been appointed Hon. Secretary.

Ulan.

A meeting of this branch was held on 11th April, when Mr. R. G. May, Acting Inspector of Agriculture, gave an instructive lecture on wheat culture.

Mr. May, who was visiting the district to sow some farmers' experiment plots, expressed pleasure in finding so many interested in the subject in a new district. He explained the need for pickling the seed, recommending 1½ lb. bluestone to 10 gallons of water, and advised then dipping the pickled wheat in lime-water before sowing in dry ground. The values of different varieties of wheat for different purposes and districts were explained. Some time was spent in answering questions, and before closing Mr. May intimated his intention to be in the district again about the time the wheat was in flower, and he invited farmers to meet him then at the plots. A goodly gathering is expected on that occasion.

Yarramalong.

The members of this branch met early on the morning of 28th May, and journeyed to Richmond by train for the purpose of visiting Hawkesbury Agricultural College. The party first visited the Richmond Aviation School. There they inspected the aeroplanes, and saw three short flights, made by the Instructor and three of the pupils.

The party then proceeded to the College, where the Principal was waiting to deliver a lecture. Mr. Potts said it was rather a difficult matter to treat a subject in one lecture which usually took a number of lectures of one hour each.

PIG-RAISING.

The first thing was to have well-bred pigs; pigs that would fatten well, and look well. A pig that had a nice fine coat of hair, and a clean skin, free from scales and wrinkles, was the one that commanded a big price in the saleyard, and this pig could only be produced by pure-bred or (if not pure) well-bred animals; and by careful feeding. It was more important to have the boar pure than the sow, as the personality of the boar was the more noticeable in the litter. Stud pigs should not be too fat, as fat deadened the sexual instinct, and spoiled the chance of a big healthy litter. The boar should never be run with the sows. As soon as the sow came on heat the boar should be put with her, and taken away again after the third day. The sow should then be run in a paddock, and not overfed. Let her search and root about for the main part of her food; this would give her exercise and keep her healthy. When she was fed she should not receive fat-producing foods, such as corn, lucerne, barley, or any green foods, and skim milk was best for her; then feed her up well for the last fortnight before she farrows to strengthen her for the coming strain, and also to produce the milk on which her litter was to depend. Give her lucerne, barley, rape, meat scraps, skim milk, but not grain foods, which were always starchy and fattening. It was not fat that was wanted, but blood and milk. It was sometimes found that sows ate their litters. This was caused by ignorant feeding.

The object of a lot of pig-raisers in raising porkers was to fatten them as soon as they were weaned. This policy was wrong. Young pigs should be fed until they were four months old on food which would produce bone and muscle, but not fat. Fat only hindered the growth of the pig. Lucerne, barley, and rape, artichokes, cowpeas, mangels, and such-like foods were best until the porker was almost ready to market, then he should receive corn or any grain food, and skim milk, as much as he would eat for the last few weeks. This would fatten him ready for the market.

It was important never to allow the pigs to become inbred. It was the greatest mistake that could be made. Give pigs plenty of lime-water and rocksalt in their pens. In cases of constipation, if the discharge was in small hard lumps, and of a greyish colour, Epsom salts should be given, and if black in colour castor oil of good refined quality should be administered, but not the common stuff that was bought in large drums. In cases of diarrhœa only light foods should be supplied, and plenty of lime-water.

At the close of the lecture Mr. Potts showed a number of lantern slides of the different breeds, and explained their good and bad points.

The Chairman expressed the thanks of the party to the Principal for his kindness. In replying, Mr. Potts issued an invitation to visit and inspect the College on the following day. This course was adopted, and the party were taken round the whole institution, much useful information on a number of points being gleaned, in addition to a very complete idea of the numerous activities of the College. A hearty expression of thanks was conveyed by the visitors to the Principal before the afternoon train was caught for home.

The regular monthly meeting of the branch was held on 2nd June, when it was agreed that application for a pruning demonstration should be renewed.

It was decided to enter an exhibit at the next Wyong Show, and a committee was appointed to organise the matter. Various suggestions were made to make the exhibit the more complete and attractive.

Mr. G. Bevan has promised a paper on dairy cattle, to be read at next meeting.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	A. J. Alcock, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
French's Forest	J. W. West, French's Forest.
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell.
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jindabyne	Sylvester Kennedy, Jindabyne.
Katoomba	W. E. Parry, Victoria Road, Katoomba.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Lankey's Creek (Jingellic).	—
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A. E. J. Anderson, B.A., Platform-street, Lidcombe.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	J. Barkell, Meadow Flat, via Rydal.
Middle Dural	A. E. Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	C. P. James, The Warren, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, Wyalong W.
Spencer	H. J. Woodbury, Spencer.
Springside (via Orange).	E. H. Selwood, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Toronto	J. Froome, Knowle Farm, Toronto,
Ulan	P.S.D. Howarth, Ulan, near Mudgee
United Peel Riv. (Woolomin).	—
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wetherill Park	L. Rainbow, Wetherill Park.
Wollun	J. B. Anderson, Wollun.
Wolseley Park	J. G. Downie, Wolseley Park.
Woonona	A. Cavill, Campbell-st., Woonona.
Wyan	—
Wyong	Edgar J. Johns, Wyong.
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yass	—
Yetholme	—
Yurrunga and Avoca.	R. Waples, Yurrunga.

Orchard Notes.

JULY.

W. J. ALLEN.

Ploughing.

THE winter ploughing should be commenced this month and completed in the early part of August, turning under farmyard manure (after being spread), all weed growth or any cover crops, so that they will have time to rot and the plant food locked up in them thus be available for the trees when required. The land after ploughing will also catch the rains of the later part of the winter and spring, and allow the subsoil to get well soaked.

Often when a cover crop has not made much growth one is tempted to delay ploughing in order to get a greater body of it to plough under. But this is a risky practice, as if the weather turns dry the cover crop will very quickly dry out the soil, and it is not only almost impossible to turn it under, but the trees are also robbed of moisture that should have been stored for their use in the soil and subsoil.

Moreover, the rotting of the crop will be slow, and, except in exceptionally wet springs, instead of doing good the opposite effect will result from the cover crop.

A drag-chain should be used on the plough when turning under tall weeds or cover crops, so that they will be completely covered as far as possible by the plough. Instead of using a drag-chain the crop can be rolled in lands in the same direction as the plough will follow.

Pruning.

This work should be pushed on this month. Apples and pears generally have dropped their leaves and will be in good condition for pruning. For the first few years after planting these trees require topping to get sufficient subdivision of branches and to control their direction, but when the scaffolding branches or main framework of the tree is well established it is often best to cease topping the leaders, and merely thin them out to the desired number. The tree will then generally slacken in top growth, and develop its spurs better along the main limbs and laterals. Topping the leaders will often be unnecessary for several seasons, but if the trees show too little vigour, topping should again be resorted to for a season.

With most apples and pears the laterals will be found to develop spurs more readily if given good length or not shortened at all, especially the stronger ones; the very slender ones may be shortened slightly, as sometimes if left long they will only develop a spur or two on their tips. Laterals that were left long last year and have again made a fairly strong growth are better left long again, for if brought back to the first spurs there is danger of starting these spurs into growth instead of cropping; it also checks the partially-formed spurs nearer the base from developing. Generally those laterals which have been left out for two seasons previously can be brought back to the spurs furthest from their base. Apples and pears often throw short laterals with fruit buds on the end, sometimes termed a fruiting shoot; these should be left as they are, as they will generally carry a crop and also develop spurs for future seasons. The spurs in old trees sometimes tend to subdivide too much and form a network of weak spurs; these should be thinned to keep a moderate supply of strong fruiting spurs. A pruner should always watch the results of his previous year's work. He will learn much from the tree he is working on.

Every tree has its own individuality, and therefore the grower should study their habits and prune them in such ways as will ensure that they will return him the best fruit from year to year.

The prunings are better picked up and burned as pruning proceeds, as then any fungus spores or eggs of insects they may carry are destroyed.

This burning is most expeditiously accomplished by mounting an old iron tank on wheels. The tank is open at the top and with a grating at the bottom.

Scions.

Scions of deciduous trees for spring grafting should be taken from healthy trees that have borne good crops of high-quality fruit. These may be kept in moist sand in a cool place till required. Scions can also be kept in cool store, and used for budding in the late spring.

Planting.

The planting of either new plantations or refills can be continued this month. Land should be prepared for the spring planting of citrus trees.

Manuring.

Slow-acting fertilisers such as bone-dust can be applied this month to give them time to decay, so that the plant food they contain will be available when the trees start growth in the spring. The more soluble manures should now be ordered, for application later.

Cleaning Stems.

Any loose rough bark should be removed from fruit trees, and any injurious insects they may harbour, such as the grubs of Codlin moth and Peach Tip moths, destroyed.

Bandages.

Bandages which have been left on apple and pear trees since the fruit season, to trap any codlin grubs that look for better shelter after the cold and rain of winter sets in, may be removed and the grubs destroyed.

Spraying.

The early blossoming peaches, such as Bell's November and Edward VII, should receive their winter spraying of lime-sulphur this month. But most of the stone fruits and apples and pears can receive this winter application later. Spraying with red oil for scale on deciduous trees and woolly aphis on apple trees should be done during the latter part of this month.

During the past two seasons a combined spray of lime-sulphur and tobacco wash applied when the buds are showing pink has been found at our Glen Innes Orchard to keep the apple trees clean of aphis as long as those sprayed with red oil applied at the end of July or early in August. The advantage is that the first fungicide spray and woolly aphis spray can be done in one operation. Of course, this experiment will have to be carried further before it can be adopted as a regular practice, but the combined spray is worth a trial on a small scale.

Brown Spot of Mandarin.

Although we do not advocate the general pruning of citrus trees till the spring, it is advisable to cut out and burn all dead and diseased wood of Emperor Mandarin trees that have been previously attacked by Brown Spot, so that they will be ready for their first spraying of Bordeaux mixture. Growers in districts where this variety is liable to Brown Spot should read the report in the *Agricultural Gazette* on the results of the experiment carried out by the Department on the control of this disease.

Harvesting.

In districts where oranges do not hang well the bulk of the crop will have to come off this month. And even in later-hanging districts, if prices warrant it, it is a good plan to lighten the trees by marketing the largest fruit, after it has coloured, throughout the season.

Lemons should be picked regularly as they come up to size. If prices are not satisfactory and they are grown in districts that will produce a keeping lemon they can be stored away in boxes; the peel will reduce considerably in size, and they can be marketed when prices warrant.

But it must be remembered that a lemon should be cut from the tree and handled with the greatest care to avoid bruises if it is to be stored, otherwise decay will set in. The same applies to oranges intended for shipping. When packing either for the home market or for shipping, size and grade should be uniform throughout a case.

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 21, 22, 23
Parkes P., A., and H. Association	G. N. Seaborn	,, 22, 23
Corowa P., A., and H. Society	J. D. Fraser	,, 28, 29
Grenfell P., A., and H. Association	G. Cousins	,, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 4, 5
Albury and Border P., A., and H. Society	W. J. Johnson	,, 4, 5, 6
Manildra P. and A. Association	A. Anderson	Abandoned.
Gilgandra P. and A. Association	G. Christie	Sept. 5, 6
Ganmain A. and P. Association	T. S. Henderson	,, 11, 12
Young P. and A. Association	T. A. Tester	,, 11, 12, 13
Lockhart A. and P. Society	E. D. Arnold	,, 12, 13
Cowra P., A., and H. Association	E. W. Warren	,, 18, 19
Narrandera P. and A. Association	H. S. Robinson	,, 18, 19
Temora P., A., H., and I. Association	A. D. Ness	,, 18, 19, 20
Holbrook P., A., and H. Society	J. S. Stewart	,, 19, 20
Canowindra P., A., and H. Association	G. Newman	,, 25, 26
Murrumburrah P., A., and I. Association	J. A. Foley	,, 25, 26
Henty P. and A. Society	H. L. Yates	,, 25, 26, 27
Yass P. and A. Association	E. A. Hickey	,, 26, 27
Newcastle A., H., and I. Association (Spring Show)	E. J. Dann	,, 28, 29
Junee P., A., and I. Association	T. C. Humphreys	Oct. 2, 3
Ardlethan P. and A. Society	W. J. Nixon	,, 3
Deniliquin P. and A. Society	L. Harrison	,, 3
Hay P. and A. Association	G. S. Camden	,, 9, 10
Millthorpe A. and P. Association	C. J. E. Hawken	,, 10
Tweed River A. Society	T. M. Kennedy	Nov. 7, 8

1918.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	J. Caldwell	Feb. 6, 7
Dapto A. and H. Society	J. J. Cook	,, 20, 21
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 26, 27, 28
Newcastle A., H., and I. Association	E. J. Dann	,, 27, 28; March 1, 2
Tenterfield P., A., and M. Society	R. G. White	Mar. 5, 6, 7
Tumut A. and P. Association	T. E. Wilkinson	,, 6, 7
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne	,, 6, 7, 8
Glen Innes & Central New England P. & A. Assocn.	G. A. Priest	,, 12, 13, 14
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 13, 14
Camden A., H., and I. Society	A. E. Baldock	,, 13, 14, 15
Cooma P. and A. Association	C. J. Walmsley	,, 20, 21
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 20, 21, 22

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Agricultural Gazette of New South Wales.

Selection of Seed Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

FROM the earliest times it is probable that some attention has been given to the selection of maize for seed. The comparatively large size of the ears, the large number of grains they contain, and the few ears necessary to shell enough seed to plant an acre, are factors which have made the selection of seed maize an interesting and easy operation.

The first method of selection was probably that of picking the largest ears for seed. This crude method, though still employed to some extent, does not make for much improvement in yield, as such ears may have been produced under good conditions, which may not be present the following year, and without these such ears are not capable of maintaining their size.

A further step in improvement by selection has since taken place, viz., the choosing of a certain type which, according to the fancy of the grower, is supposed to be correlated with yielding capacity. When this type represents the majority in a variety which has become well acclimatised and adapted to a certain district, it is probable that some improvement in yield is effected.

There are, however, certain fundamental points in the selection of seed ears *of any variety* of maize, the observance of which makes for continuous improvement. The chief of these points are weight of ear and percentage of grain per ear, shape, length and circumference of ear, filling of tips and winding of butts, uniformity, depth, and shape of grain, and space between the rows and grains. Combined with greater attention to field characters and to uniformity in the main characters which define a variety of maize (period of maturity, colour of grain and core, size of grain and character of dent), it is possible to effect fairly rapid improvement, especially by the *establishment of special seed plots in which cross-fertilisation takes place only between these more desirable types.*

Size of Ear.

As the size of the ears in a field of maize is dependent on the season, soil, thickness of planting, and other factors, no definite rules can be laid down as to the best absolute size to select. There is however, a standard ear length for different varieties grown under average conditions, and it is wise not to depart much, if possible, from the standard. For instance, late varieties have naturally a larger ear than early varieties, and the selection of large ears for early varieties and small ears for late varieties is not productive of the best results when the standard size is available from the same crop. An example of this was afforded in a striking manner in an ear-row test with Gold Standard Leaming, an early variety, at Dapto, in 1915. When this test was harvested, and the highest yielding ears determined, it was found, by referring to the residues of the ears which were saved, that those of 8 or 9 inches in length considerably outyielded those an inch or two longer—in fact, the largest ears were the lowest yielding. From this it was inferred that the large ears were not natural to the variety, and that better results would be obtained by adhering to the standard size.

If the conditions during a particular season have been such that the standard ear length of the variety is not reached, it is usually thought that the crop is not good enough for seed, and the general practice is to introduce fresh seed from an outside source. This is a practice which cannot be too strongly condemned. Owing to its not being acclimatised, the introduced seed cannot put forth its maximum production, and loss of yield results, not only the first year but also perhaps the second and third years, until the new strain becomes thoroughly adapted to its new environment in the way of climate and soil.

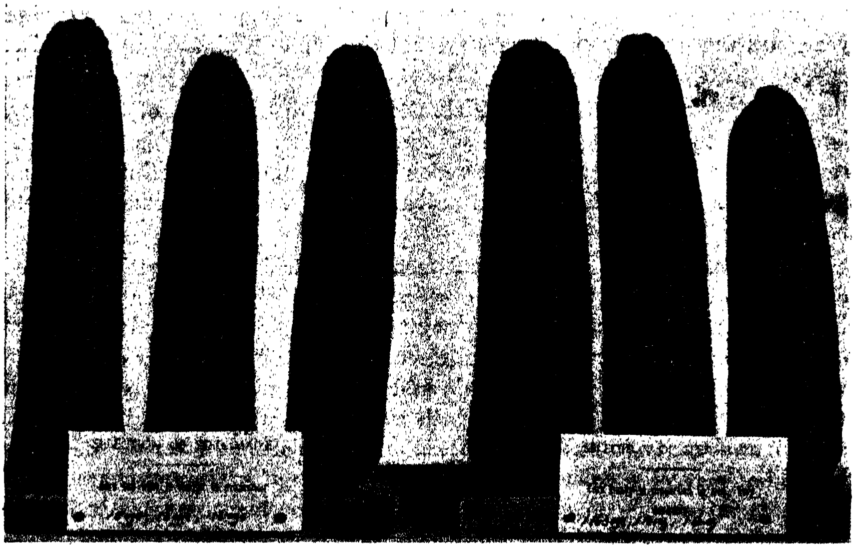


Fig. 1.—The weights of these ears reading from left to right are 15 oz., 13 oz., 13 oz., 1 lb. 3 oz., 1 lb. 1 oz., 1 lb. 1 oz., respectively. The former three are too light in weight in proportion to their size, a fact which is readily discovered on handling the ears.

Increased yields have been obtained in nearly every part of the State with acclimatised seed, but the most notable instance was seen in 1915, at Berry. Here an increase of 9 bushels per acre was obtained with acclimatised seed from a poor crop over a prime sample of the same variety introduced from good soil in a different locality. The ears used for seed in the former case were much smaller than those of the latter, and the results of this experiment and of others indicate the value of using acclimatised seed ears, even though the length of such ears is not up to the standard size for the variety.

Weight of Ear.

One of the most important points in the selection of seed ears is to choose those of average size which are heavy in proportion to their size when dry. Very few ears selected in this way by rough estimation of weight in the hand have to be thrown out for poor grain when shelling. It is only natural to expect to find good grain on those ears that weigh well (especially in proportion to their size), since from 80 to 85 per cent. of the total weight of most ears consists of grain.

In selecting a very large number of ears for a bulk of shelled grain to plant a large area, it is obviously impossible to go into the finer points which should be considered in selecting ears to plant a special seed plot, and selection for this point (good weight for size of ear) is one of the most important factors to be considered, not only in this but in all cases.

Circumference of Ear and Size of Core.

With the standard length that is expected of well-grown ears, there is also a standard circumference of the best ears, which varies from three-quarters to four-fifths of the length. It is by no means intended that the selection for circumference of ear should be made by actual measurement, and that all those ears should be discarded which do not come within the aforesaid proportions; but the above figures are those of a well-shaped ear, which can be readily picked out by rough judgment, and such ears are much more desirable than those which have an excessive circumference for their length, or *vice versâ*, as both these latter types are usually lower yielding.

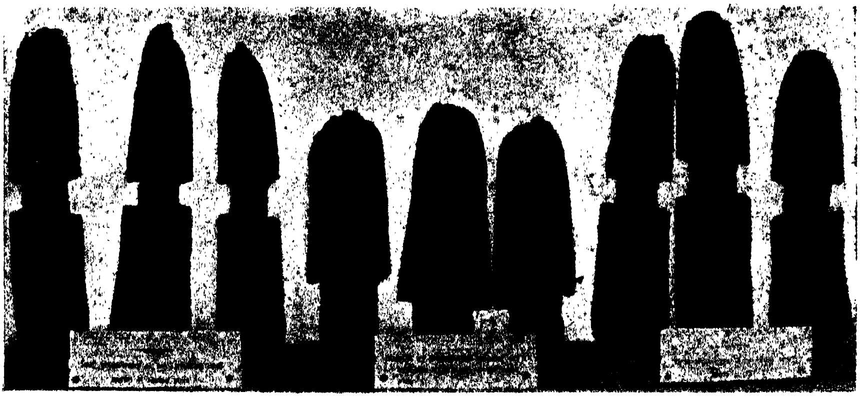


Fig. 2.—The three ears on the left have too small a core and circumference of ear for their length. It will readily be observed that they will not shell as much grain as the ears with a core of moderate size on the right. The three centre ears have too thick a core and too large a circumference for their length.

The depth of grain is a factor which must be taken into account when considering the size of the core. Firstly, it is well to remember that the larger the core the greater the amount of grain it is able to carry, and there is no objection to a core of moderate size for this reason. There is, however, a limit beyond which it is inadvisable to go, partly because a core of excessive size takes a considerable time to dry out, and the grain on the ear is likely to develop mould in storage, and partly because of the corresponding increase in the thickness of the shank which supports the ear and keeps it erect at maturity instead of allowing it to droop and be resistant to the weather. At the same time a small circumference of ear should be looked on with suspicion until the depth of grain is noted, for many ears of narrow diameter are due to a shallow grain.

The ideal of a very large number of farmers in selecting seed ears is to get deep grain with a small core. On closer observation it will be seen that by following this ideal too rigidly, and without regard to circumstances, some decidedly wrong results will be obtained. In the first place, a small core usually means fewer rows and less grain (in amount) than a core of moderate size. Secondly, under the good rainfall conditions of most maize districts there is a tendency for the core to become larger. This is also the case on rich or strong land. In these cases, then, the selection of ears with a small core is simply going in the contrary direction to that in which the environment is adapting the type. Under such conditions loss of yield certainly results from the selection of small cores, even though the grain be deep. The results of observation with several varieties and types during the last few years seem to indicate that there is a strong correlation between small cores and drought resistance. Amongst the dent varieties this is to be observed, particularly in Silvermine, King of the Earlies, Funk's Yellow Dent, Hickory King, and Giant White, which have all earned a reputation for doing well under dry conditions.

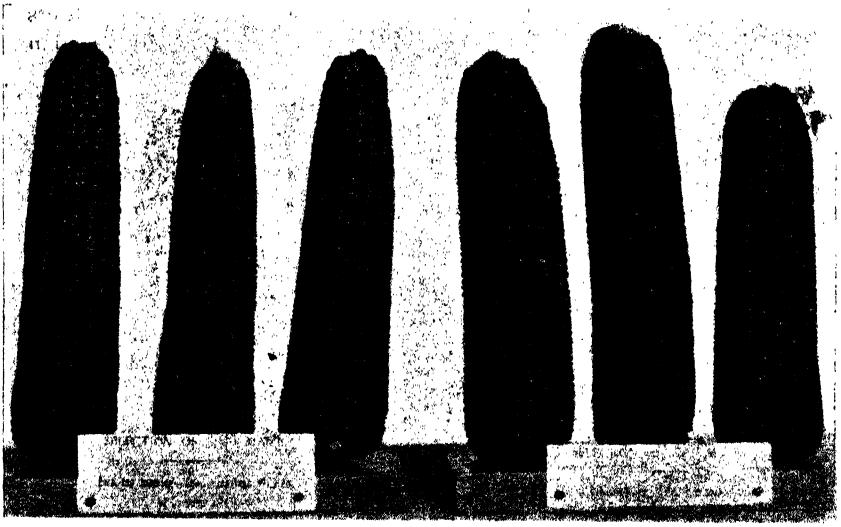


Fig. 8.—The ears on the left are too tapering, and do not shell as much or as uniformly-sized grain as the more desirable cylindrical ears on the right.

Shape of Ear and Straightness of Rows.

The shape of the ear varies from nearly cylindrical to very tapering. As a general rule, the cylindrical ear is the more desirable type for selection, because it carries more grain than a tapering one. A cylindrical ear will also contain grain of uniform size, shape, and depth, almost right up to the tip, and will thresh out a greater percentage of grain than a tapering ear on which the grain becomes narrower in width and shallower in depth from the butt to the tip of the ear. Again, a tapering ear is inclined to suffer loss of rows, leading to irregularity in shape of grain. This is particularly observable in ears of some early varieties, such as Early Yellow Dent, and is also seen in some ears of Leaming, which has a somewhat tapering ear character. In this latter variety, however, there are a number of other good characters which make up for the tapering of the ear, and it ranks amongst the best for percentage of grain per ear.

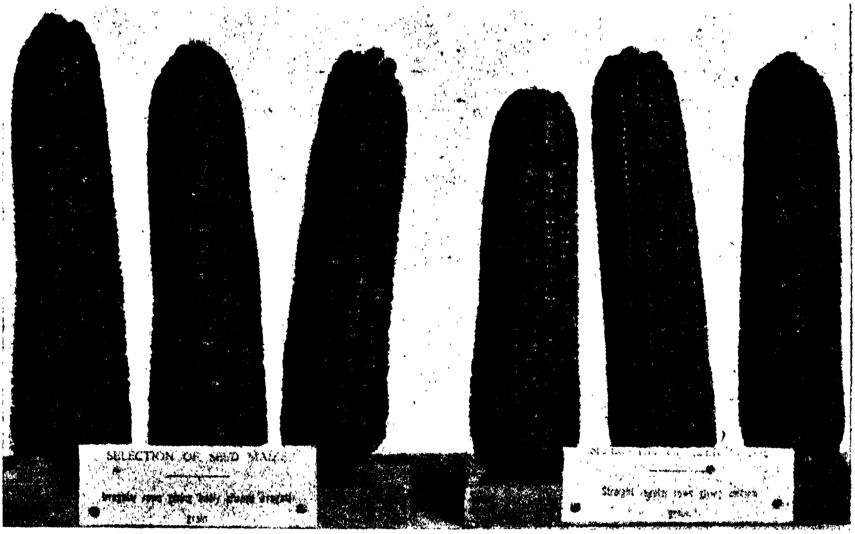


Fig. 4.—The ears on the right show straight regular rows of uniform grain, while those on the left have irregular rows and grain, and are undesirable for seed.

Selection for staightness of rows and regularity of grain is also desirable. Ears with twisted rows or with irregular grains do not shell the highest percentage, and the planting of such ears will not only increase their number in the crop, but also render the irregularity or twisted character more pronounced.

Ears with swollen butts, even though they contain an extra two or four rows of grain, are also to be avoided. They usually have thick shanks and stand erect on the stalks at maturity.

It is also advisable to avoid those ears with swollen or divided tips. These are common in some varieties, and they are objectionable on account of the fact that in almost all cases they so push out the covering husk as to leave the tip of the ear exposed, and weevil or weather easily obtains entrance and damages the ear.

Space between Rows and Grains.

Ears which have a wide space between the rows of grain almost invariably give a lower weight of shelled grain, and this is accentuated when the furrow is deep as well as wide. There is, however, the other extreme, for some ears have practically no space between the rows, the grain wedging itself in so closely as to be contiguous between adjacent rows for the whole of its length. Such ears—beside giving grain of poor shape and colour, shallow and pointed, with weak germs—do not dry quickly, and mould often develops at the tip of the grain next the cob. The space between the rows should be deep as a first essential for quick drying of the grain and core; and this factor is important in moist climates where drying takes place slowly. Although a narrow and deep space between the rows will shell the greatest percentage of grain, it has been observed that a medium wide but deep space usually gives grain of better and brighter colour.

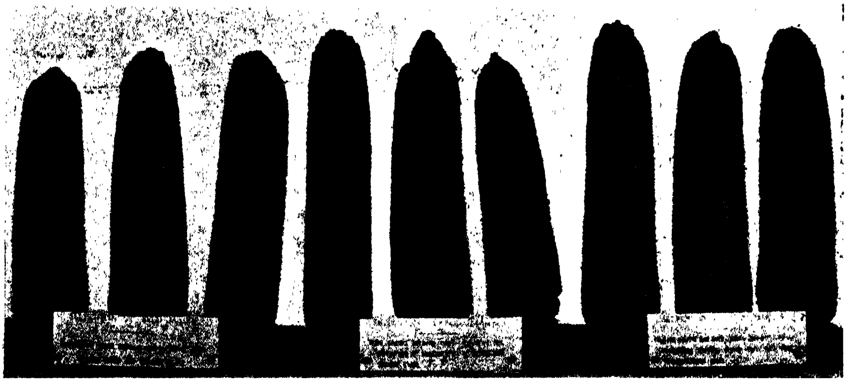


Fig. 5.—The three centre ears have too wide a furrow between the rows, these on the right have a medium space which is desirable, while those on the left have too narrow a space between the rows for the deep grain in this variety—Red Hogan.

When the space between the rows is shallow, greater trouble is also experienced in drying. Grain of rounded shape with a smaller rounded crown is indicative of its having come from an ear with wide spaces between the rows.

In breeding for drought resistance, however, the results obtained so far seem to indicate that the wide spaces between the rows are somewhat related to resistance to dry weather or adaptability to poor land. This has not only been observed in Hickory King, which has a reputation for doing well on poor land, but also in Golden Nugget and other yellow varieties of a somewhat flinty nature.

There is also a loss in weight and shelling percentage in those ears which contain much space between the grains in the row. The grain may be contiguous at the tip, *i.e.,* next the cob, but become thinner towards the crown, leaving large air spaces between the grains in the rows. This is particularly observable in some types of so-called "horse-tooth" varieties, but it may also be the result of improper filling out, due to immaturity or dry weather. Such ears are readily detected by their "pinched" appearance.

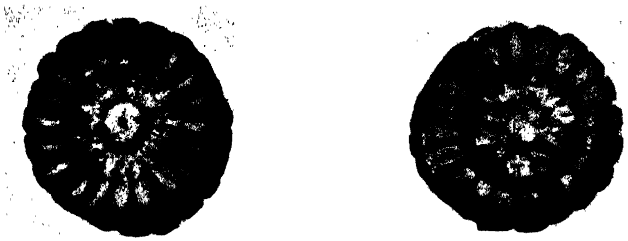


Fig. 6.—The ear on the right shows some large spaces at the tip of the grain next the cob, due to immaturity or the effect of dry weather. The ear on the left has well-packed full tipped plump grain.

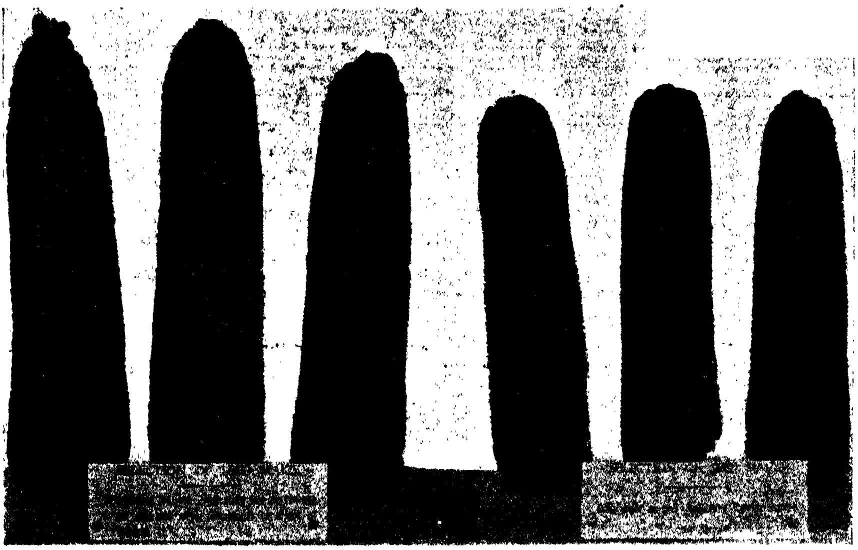


Fig. 7.—The ears on the left show large spaces between the grains in the row, with grain loose on the cob, while the ears on the right show grain firm and tight on the cob with no spaces between the grains in the row.

It does not necessarily follow that when the *dent* of the grain is rough and pinched, due to its high starch content or starchy cap, that the *grain* is pinched, for it is possible to have a *pinched and rough dent* with *plump grain,* as in the variety Goldmine.

The space betwen the grain in the row may in other cases be observable only at the tip of the grain where it is attached to the cob. This cannot usually be determined until the ear is shelled, except that such an ear will generally be light in weight in proportion to its size when dry. This defect is usually due to the lack of adaptiveness of the type or variety to the soil or locality, or it is the result of drought or frost.

Other cases will occur where there is such a large space between the grain in the row that the grain is quite loose on the cob for the whole of its length. This is sometimes due to the grain drying more quickly than the core, and it is sometimes self-remedied when the cob shrinks, making the grain pack tight again. But when an ear is thoroughly dry and there is still a looseness of the grain, it is generally a sign of failure to mature properly. It is, however, a natural character in some "horse-tooth" types.

Space between the grains on the ear may also be present at the tips of the grain between the rows, as is seen in a cross section of the ear. This is due to inadaptability or dry weather.

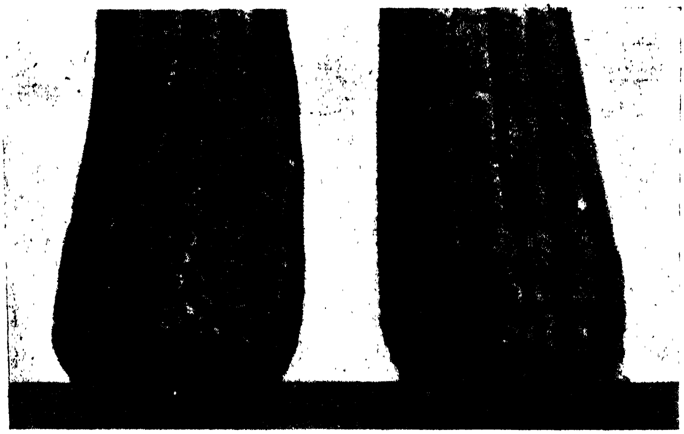


Fig. 8.—Ear on the right showing divergent butt grains with wide spaces between them—the result of a loosely-clasping husk. Ear on the left with compressed butt grains, indicating a tight husk.

Shape of Grain.

A slightly wedge-shaped, fairly thick grain, with straight sides and a full, well-shouldered tip, is the ideal shape of grain. Where the sides of the grain are rounded, it is due, as explained before, to wide spaces between the rows. Too distinct a wedge shape from crown to tip leads to space near the cob, and when the grain is distinctly pointed, it usually has a small and weak germ, and is of low feeding quality. On the other hand, grain of rectangular shape with square shoulders, which are as broad as the crown, usually indicates a small number of rows on the ear and lower shelling percentage.

Most grain is deeper than it is broad, but in some varieties the breadth exceeds the depth. In the variety Hickory King several ears will be found with grain of greater breadth than depth, but this type is undesirable. The best ears of this variety have a depth of grain exceeding its breadth, and grain with fairly straight, not rounded sides. This indicates a larger number of rows, ten or twelve instead of eight, and also a higher shelling percentage.

A thick grain usually has a good germ, and for milling purposes it is also desirable on account of a higher starch content, and less bran and waste for the miller.

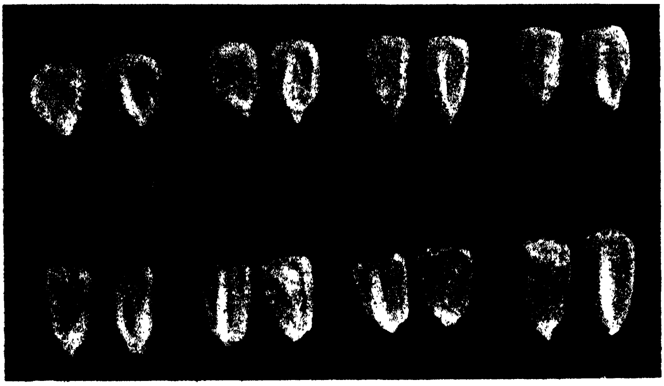


Fig. 9.—Showing different shapes of grain. The grain in the bottom right hand corner is the ideal shape. The others are either too short, too pointed, or too rounded.

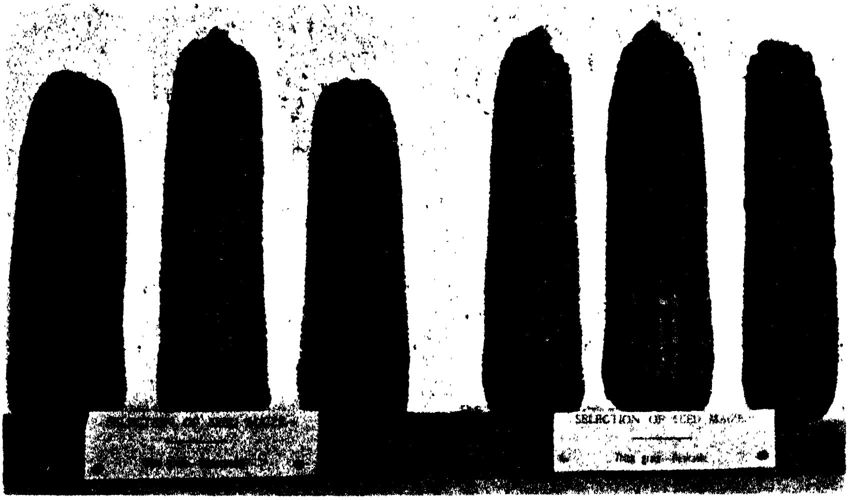


Fig. 10.—The ears on the right have thick grain which is especially desirable for milling. Those on the left have a thin grain of poorer vitality.

Length or Depth of Grain.

Selection for depth or length of grain has perhaps been given more attention by farmers than any other character. There is no doubt as to the value of selecting for this character to increase the yield.

The length of the grain varies with different varieties, and increases almost directly in proportion to the length of the growing season of the locality. In cold climates with short seasons, *e.g.*, on the New England, dent varieties seldom average more than 7/16th or 8/16th inch in length of grain, while on the warm North Coast 10/16th or 11/16th inch is quite common. There is also a seasonal influence, deeper grain being produced in a good season.

In any season, however, there is much variation within the variety in the depth of grain of different ears, and any variety is open to considerable improvement by selection in this character. One point that is often overlooked in selecting for deep grain is the fairly general rule that ears with a rough dented grain have deeper grain than those with a smooth dent. Too many farmers still confuse roughness of dent with pinched grain, and therefore do not make the best use of their deep grain in selection.

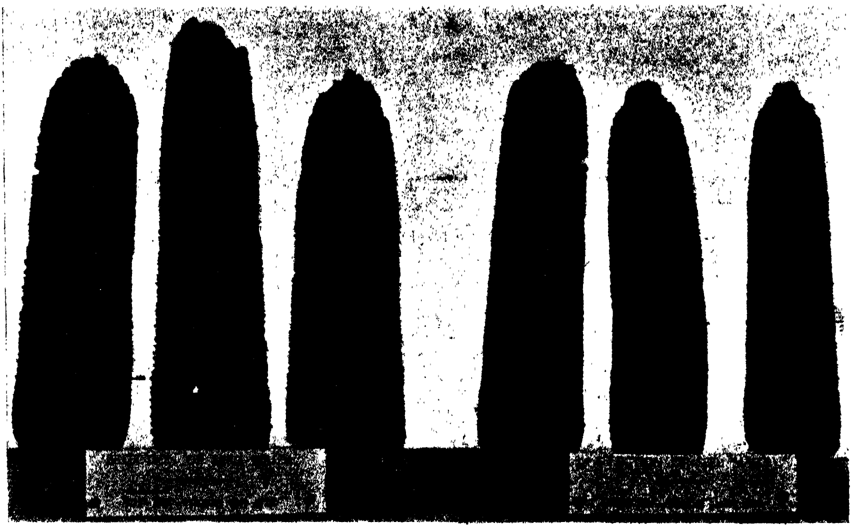


Fig. 11.—The three ears on the left show a rough dent with deep grain, while those on the right have a smooth dent which usually means a shallow grain

With chaffy cored varieties like Boone County White, it is often very difficult to see the length of grain unless a few grains are removed for inspection.

Uniformity of Ears and Grain.

In the selection of seed ears more attention should be paid to uniformity in the appearance of the ears, and also in the size and shape of the grain, than is usually done.

Ears that are uniform in size, shape, appearance, and character of dent indicate greater purity of variety. This means greater uniformity in maturing, and also more uniformity in time of flowering. Owing to the manner in which a maize plant in a field depends on its neighbours for the fertilisation of its flowers (*i.e.*, silks), this uniformity in time of flowering is very important. Those plants in a field of maize which flower much later than their neighbours have little chance of being fertilised, and barren stalks are the result. In the ear-row test work at Grafton in 1915, a row was observed during growth in which the flowering period extended some time past that of the majority of plants in the field, and which was also very uneven in flowering. It was observed later that this row matured very unevenly, and that when it was harvested it had 30 per cent. barren stalks, and yielded less than half that of each row on either side. On examination the original grain was found to be slightly different in type to the majority of the ears planted.

The more uniform it is possible to get the sample of grain for planting, the more uniform will be the dropping or sowing from the planting machine, and the better will be the yield. When the required number of grains (say, three) is dropped 95 times out of 100 it may be said that the grain is uniform; but with grain that varies to any extent in size and shape, it will be impossible to drop three grains more than about 60 times out of 100, while the remaining forty hills will contain 1, 2, 4, or 5 grains respectively. This cannot but reduce the yield, for in those hills where only one grain is dropped, the single plant can never produce as well as a three-stalk hill, while five-stalk hills mostly result in a few "nubbins." It is for this reason that the butt and tip grains are removed from the ears before they are shelled for seed.

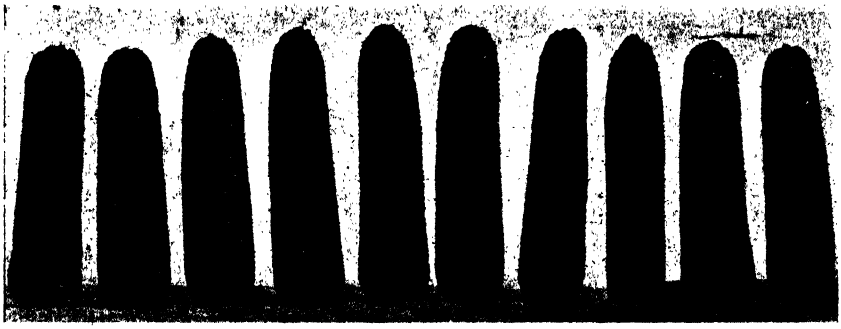


Fig. 12.—Showing the uniformity attained with the variety Red Hogan, at Hawkesbury Agricultural College, after two years' work in selection.

Uniformity in colour of core is also an important point. The inclusion of a seed ear with a white core in a yellow variety in which the red core is the proper type, leads to the production of white and white-capped grain, which is an objectionable admixture.

Uniformity in the colour of grain of the selected ears is also a point to be remembered, for grain of mixed colour mostly brings a diminution in price of 1d. or 2d. per bushel.

Trueness to Type.

As with defined breeds of stock whose value lies in their purity because of their transmitting power, we endeavour to preserve the characters of the breed by defining the qualities it should possess, and not allow anything which does not correspond to this description to be called pure, so we should exercise more care over type in maize. Different general types will be found suited to different conditions of soil and climate, just as is the case with stock; and pure-bred varieties of maize which are adapted to the conditions under which they are grown give not only a higher yield, but also better quality than those of unsuitable or mixed type.

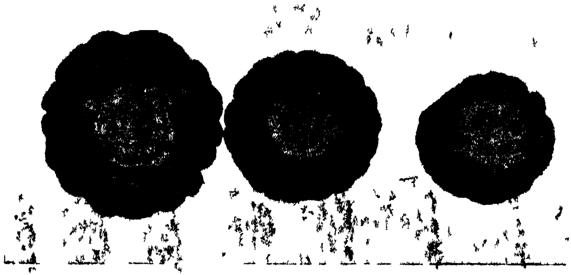


Fig. 13.—The ear in the centre shows a regular, well-filled and well-rounded butt, which is indicative of good breeding. The one on the right has a poorly-filled flattened butt, while that on the left has a coarse irregular swollen butt.

Filling of Butts and Tips.

Ears which have their butt ends well rounded and filled with grain will be found to shell a good percentage of grain, and the prevalence of well-rounded butts in a variety is usually indicative of good breeding and selection.

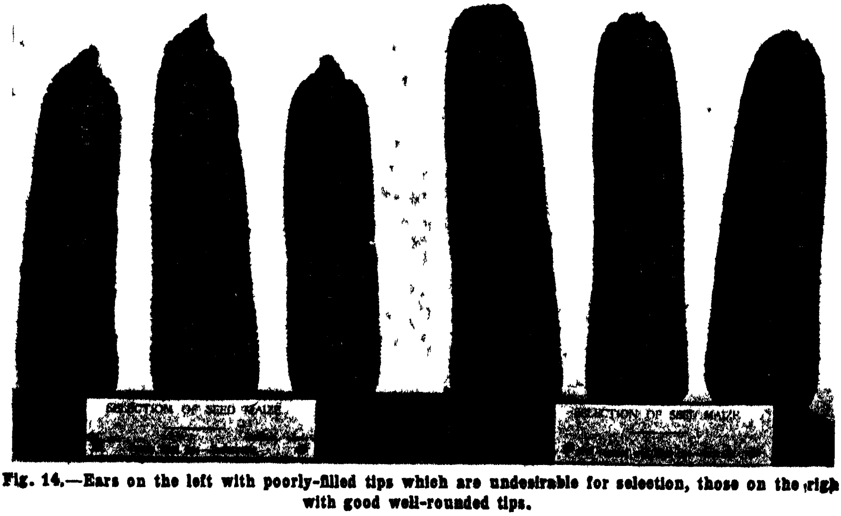


Fig. 14.—Ears on the left with poorly-filled tips which are undesirable for selection, those on the right with good well-rounded tips.

The filling of the tips of the ears with grain is perhaps not so important as is generally thought. It is found in many cases that ears with tips completely covered with grain are smaller than the average. It must be borne in mind that the silk develops slightly later than the tassel in the general crop, and also that the silks at the tip of the cob are the last to push out of the husk, and it therefore often happens that they are not pollinated. Therefore those ears with well-covered tips are earlier in flowering and maturing than the bulk of the crop, and earliness is usually negatively correlated with yield.

The best type of tip is one which is oval or rounded, and fairly well filled with grain of uniform regular size. Funk's Yellow Dent is a variety in which bare tips are very common, but the tips are mostly good on account of the regular, even-sized grain.

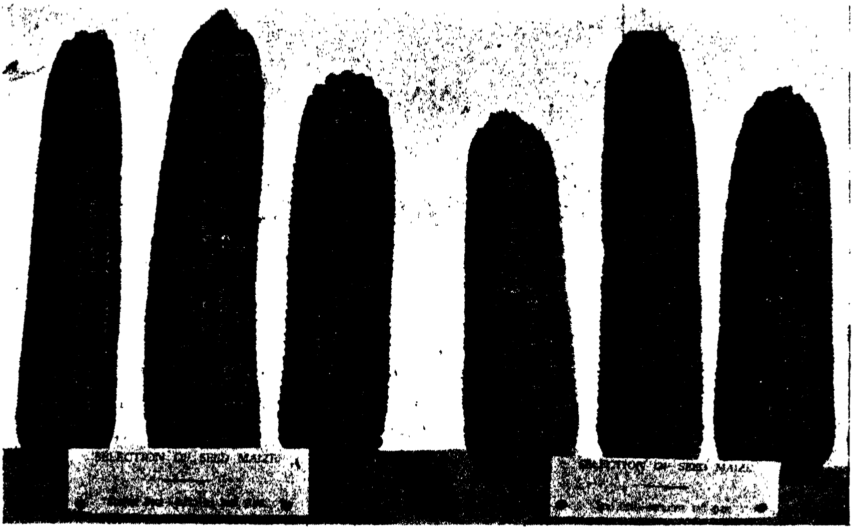


Fig. 15.—Ears on the left with shallow dent indicating hard grain, those on the right with deep dent indicating soft grain.

In some varieties the tip breaks up into irregularly placed grains extending over the last inch or so of ear, and, although partly varietal, this character is open to much improvement. It is mostly seen in some ears of Leaming.

Character of Dent.

The correlation of depth of grain with roughness of dent has already been referred to, but it may be that the smooth or slightly rough dent is a variety character, to depart from which would so alter the nature of the variety as to render it less suited to the conditions under which the maize is being grown. For instance, it has been found in the variety Early Yellow

Botanical description.—We have several weeds and garden flowers belonging to the genus *Centaurea* in New South Wales, and therefore it will be useful to many to have a description of the genus.

Genus *Centaurea.*—Involucre globular or ovoid, the bracts imbricate, numerous, ending either in a prickle or in a fringed or toothed appendage. Receptacle bearing numerous bristles between the florets. Florets all tubular and five-lobed, the outer row often larger and neuter. Anthers tailed. Style branches linear, often cohering, thickened at the base. Achenes glabrous, usually obliquely or laterally attached at the base. Pappus short, of simple bristles or scales, sometimes very short, or rarely wholly wanting. Erect or prostrate herbs, usually rigid. Leaves alternate, entire or pinnatifid, rarely prickly. Flower-heads large and solitary, or smaller and paniculate. Florets purple-blue or yellow.

Species *calcitrapa.*—A coarse green annual, rarely slightly woolly. Leaves pinnatifid, not decurrent. Flower-heads sessile amongst the upper leaves or in the forks ovoid. Receptacle with bristles. Involucral bracts ending in long, stiff, spreading spines, with smaller prickles at their base. Florets purple, all tubular. Pappus, none.

How to get rid of it.—Being an annual, the Star Thistle should be destroyed when just coming into flower. It can be ploughed in if the pest is abundant. It bears an enormous quantity of seeds, which are wafted about by the wind, so that it is of little use to clear a paddock of the weed if there is plenty of it on your neighbour's land. Road maintenance men should be instructed to carefully destroy this and other weed pests found growing by the road-sides. Road-sides are notoriously such propagating places for noxious weeds (which are brought along by travelling animals, in the first place), that it is to be hoped that officers in charge of roads will, as a national duty, see to the extermination of the most injurious weeds. The eradication of the worst weeds would, in most instances, hardly increase the work of a man to a perceptible degree, and, with vigilance, the work to be done would rapidly diminish.

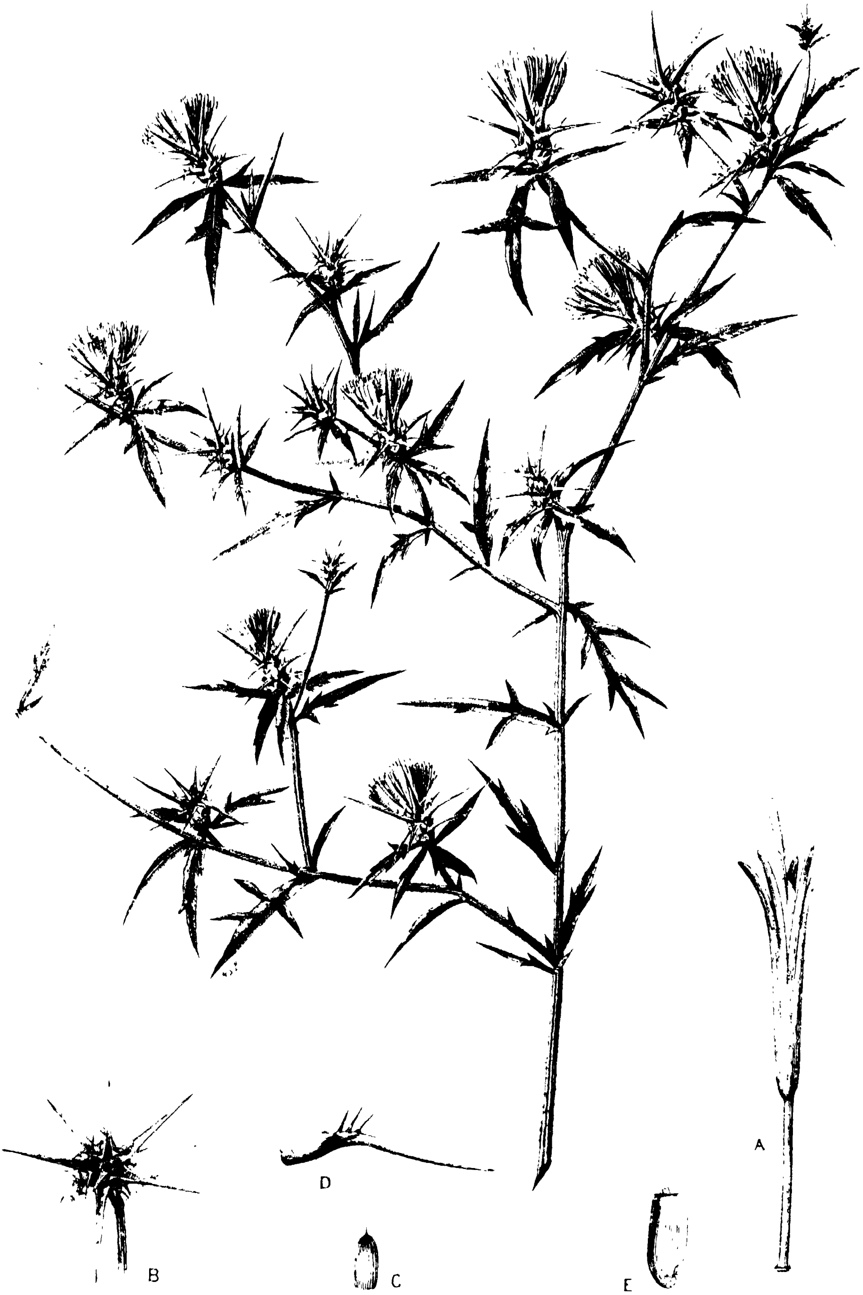
Where found.—The Star Thistle is a native of the countries in Europe, Asia and Africa surrounding the Mediterranean, and also Great Britain and other countries of middle and northern Europe. Its range is pretty well that of *Kentrophyllum* (or *Carthamus*). Now, however, it is to be found in probably every country in the world except the coldest.

The following paragraph, taken from my original article in this *Gazette* for 1894, may be instructively compared by all landowners with the lists of

EXPLANATION OF PLATE.

True Star Thistle (*Centaurea calcitrapa*, Linn.).

A. One of the individual flowers of which the "head" is composed.
B. A "head" or thistle, in fruit, showing the formidable involucral bracts—hence the comparison to calthrops.
C and D. Two extreme forms of involucral bracts.
E. Seeds.



WEEDS OF NEW SOUTH WALES.

THE TRUE STAR THISTLE.

Centaurea calcitrapa Linn.

municipal and shire councils (supplied by the Local Government Department) of the New South Wales areas in which it has been proclaimed up to 1917. If it continues to spread at the present rate, in a few years it will be proclaimed for the whole State :—

> There are a number of plants in the vicinity of the cattle and sheep saleyards at Homebush. At first I knew of only one, which I used to visit regularly for specimens, but since then I have found several in Homebush and Flemington. It was probably brought to these localities by sheep, the seeds being stuck in their wool. Only a month ago Mr. Ross, of Bathurst, writes that he has noticed it there for the first time. It has been sent recently to the Department from Wagga Wagga, Grenfell, and Gunnedah. I have seen it in other parts of the Colony, and have received it from additional localities. Generally, I have noticed it in small patches at very wide intervals. It is a most insidious foe, and landowners are recommended to make themselves acquainted with it, and to keep their land clear of it.

The list of shires and municipalities in which this pest has been proclaimed is already formidable, as may be seen from the following, furnished by the Local Government Department, 1917 :—

MUNICIPALITIES.

Balmain
Bathurst
Botany
Braidwood
Burrowa
Burwood
Carcoar
Concord
Coonamble
Cootamundra
Corowa
Cowra
Dubbo
Goulburn
Hay
Junee
Lismore
Maitland, West
Manilla
Molong
Mullumbimby
Murrumburrah
Murwillumbah
Orange
Queanbeyan
Quirindi
Richmond
Temora
Wagga Wagga
Windsor
Yass
Young

SHIRES.

Abercrombie
Barraba
Berrigan
Bibbenluke
Bland
Canobolas
Carrathool
Cobbora
Cockburn
Coolamon
Coreen
Crookwell
Culcairn
Dalgety
Dumaresq
Gadara
Gilgandra
Goodradigbee
Gundurimba
Gunning
Hume
Jindalee
Lachlan
Liverpool Plains
Lockhart
Lyndhurst
Macquarie
Mandowa
Mulwaree
Mumbulla
Murrumbidgee
Murrungal
Narraburra
Patrick Plains
Peel
Talbragar
Tamarang
Tenterfield
Terania
Tumbarumba
Tweed
Wakool
Wallarobba
Waradgery
Waugoola
Wingadee
Wollondilly
Yarrowlumla

Cockspur or Saucy Jack (*Centaurea melitensis* Linn.).*

Other Vernacular Names.—" Saucy Jack " is a name by which this weed is very commonly known. " Burr," " Yellow Burr," and " Chinese Burr " are less common names. It does not come from China, nor am I aware that the Chinese have had anything to do with its introduction or dissemination. Its name *melitensis* denotes " Malta " (adjective), hence " Malta Thistle," though I do not remember having heard it called by that name by farmers. It would be simply impossible now to upset the names of " Cockspur " and " Saucy Jack."

Botanical name, Centaurea.—With an allied plant the Centaur Chiron is said to have cured the wound in his foot, caused by the arrow of Hercules. *Melitensis*, Latin for Maltese, Malta being one of its Mediterranean localities.

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* Much of the information in this article was published in Volume VI, but it is reprinted for general information.

What our farmers and pastoralists say of it.—Following are some of the replies relating to Cockspur sent in answer to the Department's circular in 1893 :—

Utterly useless. Grows as a rule in cultivated lands. No attempt has been made to eradicate it. (Singleton.)

First made its appearance about thirty-two years ago. Mostly favours cultivated land, and promises to be a most troublesome weed. It excludes valuable grasses wherever it makes its appearance. Little or no attempt has been made to eradicate it. (Manilla).

Flourishes and spreads in any soil, or under any condition. In some instances it is kept in check by cutting down and burning. (Narrabri.)

Is exceedingly troublesome in wheat paddocks. Many of the farmers cut it down, whilst others make no attempt to keep it in check, thereby seeding their adjoining neighbours' clean land. (Mudgee.)

Found growing throughout the district. (Eglinton, Bathurst.)

The sharp spines and bitter taste destroy the value of hay when it becomes mixed with it. Frequents good alluvial lands, either cultivated or uncultivated, also public roads, by which means many weeds are spread. Many farms in the district are perfect seed-beds for noxious weeds. (Comobella.)

Grows in almost any situation, though, as a rule, on the rich river flats. It is spreading on uncultivated land, but kept in check on cultivated lands by annually hoeing. (Pomona, Wellington.)

Introduced from the Upper Macquarie by the waters of the river. No steps have been taken for its eradication. Spreads rapidly on cultivated land and rich soils, while poor grass lands are almost free from it. (Wellington.)

Depreciates quality of forage crops, and is spreading all over the district. First appeared in 1884, when seed was introduced by sheep. In cultivated lands the farmers do their utmost to keep it under control, but in uncultivated lands no steps have been taken for its eradication. (Orange.)

Brought sixteen years ago into the district by travelling stock. Is very troublesome in cultivated land. (Molong.)

Will thrive in almost any soil. When mixed with hay and chaff it greatly reduces the price of these fodders, on account of the bitter taste and thorny quality of the seed, which makes it a very difficult task to separate from other grain. In order to keep it in check several of the farmers resort to summer fallowing, and destroying the weeds with the hoe. (Neville.)

Made its appearance about fifteen years since. It is very troublesome to the wheat or hay grower. When young, during the winter months, it is splendid feed for stock; later on the leaves and seed-pods are surrounded with spikes, which at times penetrate strong boots. Early in the morning during dry seasons, before the dew has left the plant, certain portions of it are eaten by stock. It is spreading throughout the district, especially in cultivated land. The local Municipal Council has a by-law compelling the eradication, by burning, of all noxious weeds in the district, and a notice is forwarded annually to residents, requesting them to do so. This effectively keeps the weed in check. (Dubbo.)

Introduced by travelling stock and floods, and mostly frequents low-lying flats along the river banks and watercourses. Stock will not eat it. No special effort has been made to eradicate it. (Dubbo.)

After the first autumn rains it springs up, and retains a green, fresh appearance when almost every other plant is dead. While young it is eaten by cattle, though to butter made from the milk of cows feeding on it, it imparts a disagreeable flavour (Hillston.)

Is spreading in ringbarked country and on the plains. With a few exceptions, no general or effective measures have been taken to keep it in check. (Condobolin.)

Almost completely covers roadways and old folding grounds. In time of drought cattle and horses eat it with avidity, and are kept in good condition. (Condobolin.)

Makes its appearance with hay and wheat crops. Possesses an exceedingly bitter fruit, and if eaten by horses has a dangerous effect. (Young.)

Cattle will not eat it. Crowds out valuable grasses. Thrives on both cultivated and uncultivated land, and is spreading rapidly. A number of landowners cut it down annually, but fresh seed is soon sown from neglected holdings. (Forbes.)

Introduced into district in hay and chaff, and spread by winds. Spreads rapidly, and wherever allowed to grow unmolested for any length of time crowds out native pasture grasses. It is a most troublesome weed, and, except through dire necessity, is never eaten by stock either in a green or dried state. In order to keep it in check it is, as a rule, cut down and ploughed in. (Moama.)

Does not grow very extensively. The farmers keep it in check. (Corowa.)

First appeared about twelve years ago. Useless as a fodder. Generally occupies the richest soils, and is spreading in both cultivated and uncultivated lands. (Yass.)

A very troublesome weed, especially in cultivated land, in which it is rapidly spreading. (Queanbeyan.)

Since farmers left off folding their sheep, it is not very common in the district. (Crookwell.)

Cockspur as a Fodder-plant.—Stock will eat this wretched plant when it is quite young. What will the poor things *not* eat if they are compelled by stern necessity? A speaker at an Agricultural Conference in 1892 stated that on certain runs, near the Lachlan, sheep had to eat this or starve, that they ate it and thrived upon it, and that it is, in fact, a pastoralist's stand-by. But I hope no one will relax his efforts for the eradication of this weed for this reason. Scarcely any vegetation can be more thoroughly indigestible than the Cockspur, to say nothing of its aggressiveness and prickly nature, and the serious extent to which it deteriorates wool. In making a list of fodder-plants it must be remembered that a far simpler process would be the enumeration of plants which animals *never* touch in Australia. The list would not be a very long one, so that the ranking of a plant, such as the Cockspur, as a fodder-plant, may not mean much after all.

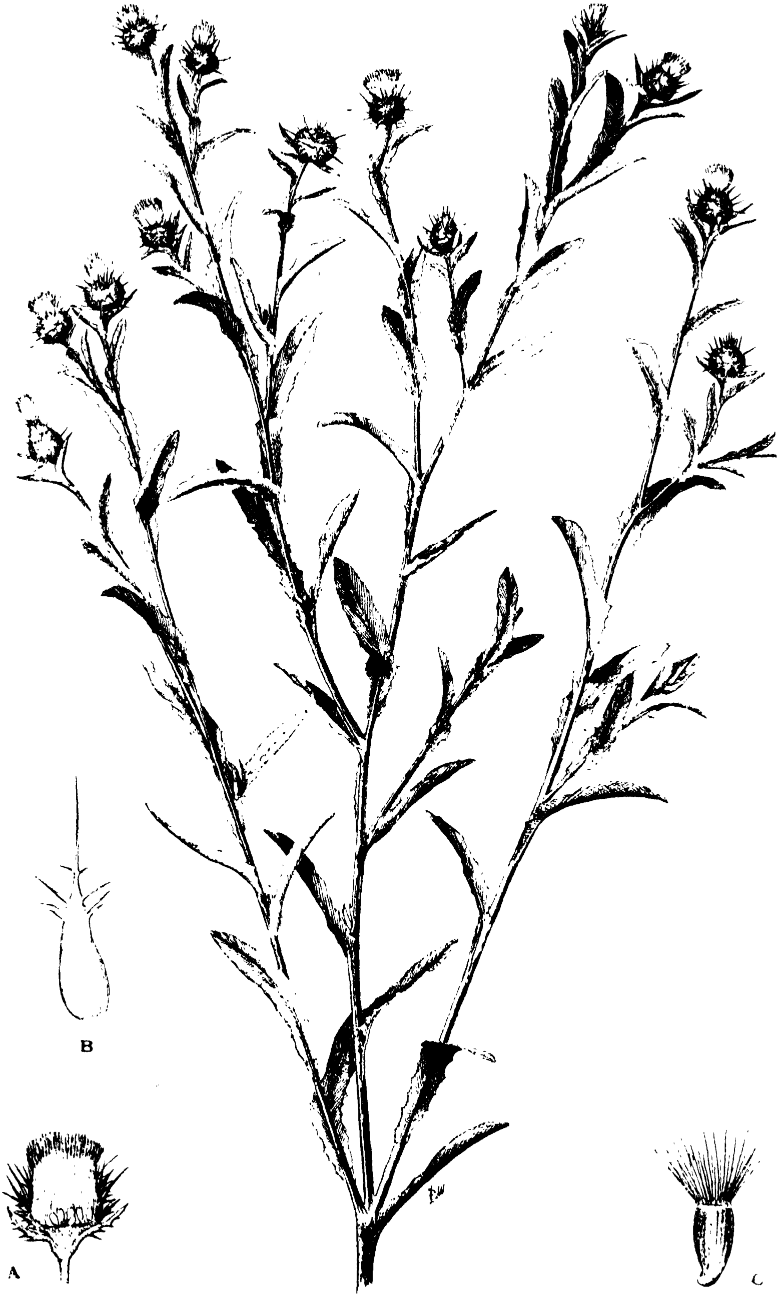
Popular description.—A so-called thistle with yellow flowers. The Saffron or False Star Thistle (*Carthamus* (*Kentrophyllum*) *lanatus*), also has yellow flowers, but they are very much larger, and the plant is altogether larger, more robust, and more rigid than the Cockspur. The flower-head is surrounded with prickly involucral bracts. The leaves are hoary and even slightly silky The edges of the leaves are wavy. Their shape may be made out from the accompanying plate. It will be observed that they clasp and run down the stem, a characteristic which may be noted. The shape of the seed can be readily made out from the drawing. It is larger than that of St. Barnaby's Thistle (*Centaurea solstitialis*), described and illustrated in the *Gazette* for March, with which the Cockspur may perhaps be confused.

Botanical description.—The Cockspur is not an English plant, and therefore a description of it will not be found in the ordinary English text-books. It may be described as follows:—An erect, rigid annual, slightly woolly white. Stem-leaves narrow, entire or nearly so, decurrent. Flower-heads terminal, sessile, ovoid. Receptable with bristles. Outer involucral bracts with short palmate spines, intermediate bracts with a long spreading terminal spine and short divaricate spines at the base. Inner bracts with only a short terminal spine. Florets yellow, all tubular. Pappus bristly.

EXPLANATION OF PLATE.

Cockspur or Saucy Jack (*Centaurea melitensis* Linn.).

A. Section of flower head, showing young seeds (natural size).
B. Involucral bract (magnified).
C. Seed (magnified).



WEEDS OF NEW SOUTH WALES.

COCKSPUR OR SAUCY JACK.

Centaurea melitensis Linn.

How to get rid of it.—It is a proscribed plant under the Victorian Thistle Act, and it is even worse in New South Wales than in the southern State. It is an annual, and should be cut down as it begins to flower. Do not allow it to mature its seed. Farmers will be disposed to reply, "That is easier said than done," but without setting ourselves at present to the herculean task of freeing the country from its worst weeds, the Cockspur is a weed that must be dealt with seriously. It is nothing less than terrible to reflect on the havoc worked by weeds in this country of recent years. The galling part of it is that much of the mischief is preventable.

Where found.—It attains its full luxuriance in the dry western country. It is not a native of Australia, and has extended here just as it has to most of the warmer countries of the world. Dr. Schomburgk states that it was first introduced into South Australia in 1844. It is a native of the Mediterranean regions.

The Local Government Department's list of municipalities and shires in which this weed is proclaimed, shows that it is spreading, but does not fully indicate its spread. We have it from Byrock and Tenterfield, so that with Culcairn the State is pretty well embraced. It will also stand the cold of Jenolan Caves and other cold places.

It is frequently confused with other Star Thistles, though the hope may be expressed that the present series of articles will tend to reduce errors of that kind.

MUNICIPALITIES.

Botany
Coonamble
Lismore
Murwillumbah
Tumut
Windsor

SHIRES.

Culcairn
Tamarang
Terania
Wingadee
Wollondilly

Starters for Pasteurised Cream.*

THE USES OF LACTIC ACID PRODUCING BACILLI IN DAIRYING.

M. A. O'CALLAGHAN, Dairy Expert.

THE bacillus associated with the production of lactic acid in large quantities is an organism that is of very definite service to mankind. This is the germ that causes what might be termed "the natural souring of milk." It may be stated that wherever milk is produced there will be found lactic acid producing bacilli in numbers, and, provided the surroundings of the place where the milk is produced are normally clean, then the first definite change that takes place in the milk is the development of lactic acid, which gives the milk a sweetish acid taste, without any trace whatever of bitterness. These friendly germs might well be termed the policemen of the dairying industry, for the simple reason that they are the great protectors of milk and cream from the invasion of unfriendly microbe life.

No matter how clean the dairy-farmer is, the surroundings of the farmyard are such that unfriendly putrefactive germs will get into the milk, irrespective of the care of those concerned. All those germs which decompose ordinary organic matter, such as manure, decaying vegetable products, &c., are ever present in the atmosphere of even the cleanest farmyard, and these germs, which are useful enough in their own sphere, are easily transferred, through the agency of wind, dust, &c., to the immediate atmosphere of the cow-bails and the dairy, thereby making it impossible to completely shut out undesirable microbes from milk drawn in the ordinary way. Then again, no matter how well we may clean the udder of the cow, a certain amount of dust, hair, &c., gets into the open milk-pail from the cow's body, and this in itself is a frequent means of the introduction of microbe life. It is also almost impossible to get anybody to realise the absolute cleanliness which is necessary in connection with milking if putrefactive germs are not to be introduced into the milk-pail through the agency of the hand and of the cow's udder.

Despite all that may be said to the contrary, and all the education that may be afforded on the subject, people will continue to dip their hands into the milk bucket in order to moisten them, so that the friction of milking will be less than if hands were dry. Consequently we will continue to have, in milk drawn by anything except sterilised methods (which are not economical in ordinary dairying), a large number of bacteria which are prejudicial to the interests of those who drink milk and of those who use milk for the manufacture of butter, cheese, or condensed milk. If, however, the dairy-farmer adopts intelligent methods to prevent the addition of all possible injurious microbes to the milk, then the large number of lactic acid producing germs which will be found in the milk will act as a preventive against the development of the injurious microbes that gain access to the milk-pail or to the separator.

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* This paper was read by Mr. O'Callaghan at the Dairy Factory Manager's Conference in Sydney on 27th June, 1917.

The lactic acid bacillus does its work of prevention in a manner which is very friendly to mankind. It produces from the milk sugar an acid which is known as lactic acid, and this acid inhibits the growth of a very large number of germs that are common to the farmyard, and that cause milk to quickly decompose, while elaborating injurious and foul-smelling products. Again, the development of a quantity of lactic acid is the first symptom which the ordinary person has of the fact that the milk is not fresh. Added to this is the fact which has been proved by that eminent scientist, the late Professor Metchnikoff, head of the Pasteur Institute, that milk which has been soured by lactic acid bacilli is specially useful from a health point of view for mankind. It is a noted fact that in those countries where sour milk is largely used as an article of diet the people suffer very little from stomach troubles.

Uses to the Butter-maker of Lactic Acid Bacilli.

Apart from protecting freshly separated cream from the effects of invasion by unfriendly bacteria, the lactic acid bacilli perform a necessary service in so far as they ripen the cream and fit it for easy churning.

The action of lactic acid, when a certain percentage has been allowed to develop in the cream, is such that the fat globules are comparatively easily brought together and allowed to coalesce into grains of butter.

In the days when hand churns were the general means of making butter, it was customary to allow cream to develop a rather high percentage of lactic acid before churning, and it is still customary to allow a fairly high percentage of lactic acid to develop in the cream produced in very cold climates before attempting to churn it. In Australia, however, where the climate is never cold—as cold is known in such countries as Denmark, Sweden, and Russia—it is not necessary to allow more than ·4 per cent. of lactic acid to develop, with the use of power-driven churns, to produce butter with sufficient facility to satisfy all that is required.

Another service which the lactic acid bacillus does to the butter-maker is that it gives the butter the particular flavour which is only associated with butter produced from cream that has been ripened, and which is so much desired by the consuming public.

After the butter is made the lactic acid germs have also a certain protective influence, in so far as they are present in sufficient numbers to prevent the early development of any injurious spores or germs that may be present, thereby having a beneficial effect, providing the butter has been well made, until such time as it can in the ordinary course of events be placed in a cold store, where the growth of all germ life is either partially or entirely suspended. In the ordinary way, Nature supplies all the lactic acid producing bacilli required by the butter or cheese-maker; but when the milk or the cream is pasteurised (that is, heated to a temperature which will destroy almost all germ life) then the lactic acid producing bacillus is killed, and if we are to have its services again we must have recourse to a fresh supply of these germs. This is the point at which what has become known as a "starter" comes into operation. A "starter" might be defined as a specially controlled growth of lactic acid producing microbes, the cultivation being practically free from all other species of microbe life.

This starter is generally produced at the factory, where it is cultivated from pure seed supplied from a bacteriological laboratory. The seed is supplied either in the form of a specially inoculated milk or in the form of a powder, the latter method being used mainly when it is desired to send the germs a long distance, or when it is advisable that they should be held for several weeks before being used as a means of producing a starter. For the purpose of use in New South Wales, the liquid form is easily the most desirable method in which to supply lactic ferment or starter seed.

Since the pasteurisation of cream has become general in New South Wales, the question of a starter for ripening the cream has been a very live matter. Before discussing the pros and cons of the subject it will be well to briefly summarise the purposes for which the lactic acid producing microbes are used by the butter-maker. They are as follows:—

(1) For the purpose of ripening the cream, so that it may be easily churned without the loss of large quantities of butterfat in the buttermilk.

(2) The protection of the cream from the inroads of injurious microbe life.

(3) The imparting to the cream, and to the butter produced, of the flavour which is associated with butter made from ripe cream, and which is a necessity in order to satisfy public taste.

(4) The protection of the butter after manufacture, to some extent, from unfriendly germs, until the butter is either placed on the neighbouring markets or put into cold store for export.

(5) The protection of the cream after pasteurisation and while awaiting churning.

Let us now take the position as it is presented to us to-day in the ordinary factory practice. Cream is delivered not more than once a day at any factory, whereas at a large number of factories the delivery is not more frequent than three times a week, even in summer. In ordinary summer weather, unless cream is specially cooled immediately after it is separated, sufficient acidity will be developed in twelve to fifteen hours to satisfy all the requirements of the butter-maker. We may take it, then, that even in the case of cream delivered six days a week, the cream produced from the night's milk will always be ripe before it arrives at the butter factory next day. If this cream is mixed with the morning's separation, the ripening process will proceed pretty quickly, and the mixture will be fairly acid by the time it reaches the butter factory that afternoon.

It might be well to point out here that if the cream is mixed in this manner the morning's cream should be cooled somewhat before the mixing takes place. It is preferable, however, to forward the cream in two separate cans when it is sent daily, and this is generally what is done. Consequently the morning's cream arrives sweet, and the cream of the evening before arrives in a ripe condition and fit for churning. Taking it for granted that these creams are of the same quality, they pass into the same vat and are put over the pasteuriser as a blended cream. The ripe cream is sufficient to give the butter the desired flavour of ripe cream butter without the addition of any further ripening; but all the other points are to some extent neglected if a starter is not used.

In connection with the use of starters for pasteurised cream, we must, therefore, consider them under two headings:—

(1) For the use of those factories that receive cream daily, and that, therefore, handle a large quantity of sweet cream; and

(2) For the use of those factories that practically receive only ripe cream, the delivery being not more than four days a week in summer.

Factories Receiving Chiefly Ripe Cream.

Taking the latter classification first, let us see what purpose would be served by the use of a starter. Firstly, all the cream has been ripened, and therefore there will be no difficulty in churning it and obtaining the maximum amount of butter therefrom; secondly, the butter will have the flavour of ripened cream butter; and thirdly, the cream will have had all the protection it could obtain from lactic acid bacilli during the ripening stages; so that there are only two points left.

The first of these is the protection of the cream from undesirable germs during the time it is held in the vats awaiting churning. This period is anything from twelve to eighteen hours, and if the cream room is kept in a proper manner no injury should accrue to the cream from germs getting in from outside during this waiting stage; but on the other hand, unless the cream is an exceptionally good one and the pasteurisation very thorough, a large number of unkilled spores or seeds will begin to germinate during those fifteen hours of waiting, and it is here that a starter would have the protective influence mentioned previously.

The only other advantage which a starter would be to this class of factory is that of giving the butter a rather brighter flavour for some days after it is first made. This flavour comes as a result of slight traces of lactic acid development in the butter. It also gives the butter some protection during its early stages after manufacture, as the development of lactic acid bacilli, which will be present in great numbers, would check to some extent at least the growth of any spores that may have remained behind after pasteurisation.

The use of the starter would, however, be no protection whatever against the growth of moulds, as these organisms prefer an acid substance on which to grow.

Factories that Handle Chiefly Fresh Cream.

The case of the other type of factory, namely, that which receives a large quantity of fresh cream, is, however, very different. Here all the advantages claimed for the original ripening are present, but to a more limited extent. The addition of the starter soon after the cream has been pasteurised and cooled will, in the first place, protect the cream from undesirable germ development until it is churned next day; and, secondly, it should have some effect in causing a greater percentage of butter to be obtained from the cream, as the more even ripening should ensure a buttermilk with a lower percentage of butterfat.

In addition, the second class of factory should have the benefit of a more uniformly ripened cream, because it cannot be held that the sweet cream which was only mixed with the ripened cream a few minutes before pasteurisation can have had the full benefit of ripening, and therefore it cannot be expected that the loss of butterfat in the buttermilk will be as low as if the cream had been thoroughly and uniformly ripened.

The question, then, for managers to consider is whether the advantages to be gained by the use of a starter outweigh the cost and trouble necessary in connection with the supply of a starter; in addition to this must be considered the disadvantage which would arise if a badly contaminated starter was used. This latter position would only occur as a result of want of knowledge or carelessness; but it is a phase of the question that must be considered, because in the very warm and moist climate of the Northern Rivers, unless the greatest care is used, a starter may quickly become contaminated, and may be in the early stages of contamination without the man in charge noticing the trouble.

If a starter is not used, then the following precautions should be taken:—

In the case of old cream, neutralisation should be carried on until there is not more than 2 per cent. of acid present, and then the temperature of the cream should be raised even as high as 195 degrees Fahr. if the "Flash" method is used, so as to ensure the killing off of all the growing undesirable germs, and such a maiming of the spores or seeds as will prevent them from growing, except under very favourable conditions.

In the case of sweet cream, where there has not been very much time for the development of spores or seeds, it should not be necessary to take the temperature to more than 185 degrees Fahr. in order to ensure satisfactory results.

If no starter is to be added, extreme care must be taken to see that the cream room is regularly treated, so that injurious germs will not be present in large numbers; and in connection with all pasteurising, so as to prevent the supply of such injurious germs, the buttermilk tank should be cleaned regularly and sterilised from time to time. The sterilisation could be done by means of a chemical disinfectant or by steam.

How to Prepare the "Starter."

Take 1 or 2 gallons, according to requirements, of clean, freshly-separated milk; heat it to 176 degrees Fahr., and keep it that temperature for an hour; then cool it to 85 degrees Fahr. as rapidly as possible, and add the contents of the bottle at the rate of 4 oz. for every gallon of separated milk. For an hour after adding the culture the milk should be stirred now and again, so as to secure an even distribution of the ferment; then it can be allowed to rest until next day—say, about twenty hours—when it will be found to be coagulated, provided the temperature has not been allowed to fall too low. The temperature should not be allowed to fall below 65 degrees Fahr., nor should it be allowed to rise above 95 degrees Fahr., a range which it should be very easy to keep in this State. When ready to use, the starter will be thick and smooth, and it should have a pleasant odour. If it is not required for use when it has reached this stage, it should be transferred to a cool room until required. The starter will improve in flavour with renewing, and the second or third day's cultivation will be found of better flavour than the first, provided the starter has been kept free from contamination, and that fresh, clean, separated milk has been used.

Many factories avoid the starter question because of the difficulty of obtaining good, sweet milk suitable for the purpose. This is a difficulty which should be easily overcome, for it should be possible to arrange with a neighbouring farmer to supply separated milk for the purpose. If fresh milk is not available, then the powdered separated milk which is manufactured in Australia is quite suitable for the purpose. All that is required is to dissolve the powder in about nine times its own weight of water, the water for this purpose being at a temperature of about 100 degrees Fahr. Though the powder is sterile when manufactured, the risk of contamination is considerable; and, of course, unless boiled water is used, the water will contain germ life that will require to be destroyed. Therefore it is necessary to heat this practically in the same way as if fresh milk had been used, though it should take a very much shorter time to bring about the necessary sterilisation in order to make it fit for adding the lactic ferment thereto.

Sweet Cream as a Foundation.

Failing a supply of fresh milk or milk powder, sweet cream can be utilised for the purpose of continuing the starter from day to day; but the cream should be either treated in the same way as the milk or put over a "Flash" pasteurising plant two or three times before what is known as the "mother starter" is added thereto. In transferring the starter from day to day, it will be advisable to use about 5 per cent. of the mother starter, with which to inoculate the freshly-prepared milk.

If cream that has not been allowed to ripen is pasteurised, it is well to add about 5 per cent. of starter; but where ripened cream, or cream nearly ripe, is used, only 1 to 2 per cent. of starter is necessary.

It may be borne in mind that it is not necessary to add as much starter to a ripened or partially ripened cream which has been pasteurised as it would be if the cream had been pasteurised immediately it had been obtained from the separator. The reason for this is that it is only necessary to produce a very small quantity of extra acid in addition to that left over from neutralisation in order to produce all the advantages desired. It is the activity of the germs that is required rather than a large additional quantity of lactic acid; and the cream may be churned when it shows the slightest extra quantity of acid more than that which was present after pasteurisation. If, for instance, the cream was neutralised to show ·25 per cent. of acid, churning may proceed when ·27 per cent. of acid is present. This will be a guarantee that the germs are active, and that the starter is doing its work.

Making Butter without Preservative.

It may become advisable for our manufacturers, in order to cater for foreign trade, to manufacture large quantities of butter without the use of boron preservatives. If such a position develops, there is no doubt whatever that a starter would be of immense advantage to our butter factories which use the pasteuriser—and there should be none which do not do that.

PICKLING ONIONS AND GHERKINS TO PRESERVE THEIR COLOUR.

THE Department was recently asked for recipes for the pickling of onions, at the same time preserving their whiteness, and for pickling gherkins, so that they retain their green colour. The following methods were described in reply:—

If the white colour that is appetising and attractive in pickled onions is to be retained, spices must be omitted. Choose the smallest onions that can be found, and. to facilitate the removal of their skins, pour hot water over them. Make enough strong brine to cover the onions, and put them in this as they are peeled. Let them remain there from one morning till the next; then replace this brine with fresh, and do the same on the third morning. On the fourth morning put the onions in fresh water and heat them to the scalding point, stirring frequently. Milk added to the water will help to whiten the onions during this boiling. Drain well and place the onions in a jar, pouring scalding hot vinegar over them.

The first essential to success in pickle-making is good vinegar, strong and pungent. Do not use a copper vessel in any part of the process; a porcelain-lined preserving vessel is best. Vinegar boiled in a copper vessel forms acetate of copper, which is a poison.

To retain the green colour in gherkins, add parsley to the vinegar some days before it is required, and let it steep thus. The vinegar should acquire a decided green colour which will necessarily be imparted to the gherkins.

Take 200 gherkins, cover with cold water, to which a pint of salt has been added. Let them stand over night. In the morning drain off this water, but measure how much is poured off. Then take a similar quantity of the prepared vinegar, add 1 ounce of whole cloves, 1 ounce of allspice, and a piece of alum the size of a walnut. Boil this vinegar and the spices, and pour it, boiling hot, over the gherkins. Cover with green cabbage leaves. A few green peppers in the vinegar give additional flavour and are a great improvement.

Fruit Nomenclature.

THE POMOLOGICAL COMMITTEE OF AUSTRALIA.—1917 MEETING.

E. E. PESCOTT, F.L.S., Pomologist, Department of Agriculture, Victoria, Secretary.

THE Pomological Committee of Australia held its fourth Conference at Sydney and at the Bathurst Experiment Farm, New South Wales, in April, 1917. The following delegates were present:—Messrs. W. J. Allen, Department of Agriculture, New South Wales, C. C. Tucker and F. Chilton, Fruitgrowers' Association of New South Wales, and F. J. Adamson, Nurserymen's Association of New South Wales; Messrs. J. M. Ward, Department of Agriculture, Tasmania, and L. M. Shoobridge, Fruitgrowers' Association of Tasmania; Messrs. George Quinn, Department of Agriculture, South Australia, and George Laffer, M.H.R., Fruitgrowers' Association of South Australia; Messrs. James Lang, J.P., Fruitgrowers' Association of Victoria, and E. E. Pescott, F.L.S., Department of Agriculture, Victoria. Mr. C. C. Tucker being taken suddenly ill at the first session, his place was taken by Mr. E. K. Wolstenholme. It is to be recorded with regret that the death of Mr. Tucker occurred on the day that the Conference closed its session.

The Committee desire to record here, with great regret, the death of Dr. Harry Benjafield, of Tasmania, which occurred in June. Dr. Benjafield was one of the early promoters of pomology in Australia, and his loss will be keenly felt by the Committee.

Mr. James Lang, the Chairman of the 1916 Conference, opened the proceedings, and Mr. L. M. Shoobridge was afterwards chosen as chairman. The report of the 1916 Conference was adopted, and it was decided to include in future reports all previous decisions, so that each report would be complete.

Representation of various States.—The secretary read correspondence from Queensland and Western Australia, neither of which States could see its way clear to send a representative to the Conference. The principal reason why Western Australia was not represented was the distance which the representative would have to travel.

The secretary was asked to write to the Department of Agriculture, Queensland, and ascertain if it were willing to agree to the decisions arrived at by the Conference.

Report of Proceedings.—In order that no particular State would receive the report of the proceedings of the Conference before the other States, it was decided to have a copy forwarded to each Department to be printed simultaneously in the August number of its official publication. It was also decided that the report should be made retrospective since the inauguration of the Committee.

Fruit Models.—The secretary informed the Committee that he had placed an order with Mr. White for four sets of models of twenty-three varieties. He had recently received advice from Mr. White that, owing to illness, he had been unable to complete the full number, and now required twelve specimens to get the exact colouring of them. A number of varieties were selected for this purpose.

The secretary also stated that Mr. White informed him he would not undertake to make further models unless for an order amounting to £200.

The Committee decided that, when the present order was completed, if found to be satisfactory, the question of having additional models would be considered

Standard Fruit Case.—Mr. Laffer said it was most desirable that all the States should fall into line with regard to a standard fruit case, as South Australia had recently shut out a quantity of Tasmanian fruit, owing to the cases being of a different size to those used in South Australia.

Mr. Ward urged that a variation of 2½ inches, more or less, should be allowed in the cubic content of the different fruit cases. He said it was impossible to accurately estimate the difference which would take place through shrinkage or expansion between the cutting of the timber and the making of the case, owing to different kinds of timber used, and some of it being more seasoned than others.

The following motion was moved by Mr. Laffer, seconded by Mr. Lang, and carried:—

> That this Conference urges upon the States which have not already adopted the standard fruit cases agreed upon at the Ministers' Conference in Brisbane in 1914, to do so at the earliest possible moment, in order that uniformity may be brought about in connection with the fruit trade in the different States of the Commonwealth.

It was decided to bring this motion under the notice of the Under Secretary and Director, Department of Agriculture, New South Wales, and ask him to transmit same to the Departments in the other States.

Method of Invitations to Members and Representatives—Mr. Laffer moved that the Departmental representative in each State should act as secretary to the Committee in that State, and should be the medium through which invitations to members should be issued; also that he be empowered to invite any prominent fruitgrowers who would like to attend the Conference. Seconded by Mr. Ward.—Carried.

Certificates of Merit.—Mr. Allen moved that the Committee prepare a list of well-known seedlings of apples and pears raised in the different States, and that the representative of each State should furnish full particulars, descriptions and photographs of the varieties raised in his State at the next Conference. Seconded by Mr. Ward.—Carried.

Local Sub-committees—Mr. Ward presented a report from the Tasmanian Sub committee of the Pomological Committee, showing the work which had been done by that body since the last Conference.

It was moved by Mr. Lang, and seconded by Mr. Allen, that the report be received. The report referred to seedling soft fruits.

No reports were received from the other States.

Co-operation of Nurserymen.—Mr. Laffer suggested that the Government representatives of the Committee in each State should give the nurserymen an opportunity of meeting them and discussing what has been done by the Pomological Committee. He thought that a personal interview of this kind would be of great assistance in getting the nurserymen to adopt the decisions of the Conference.

Blight-proof Apples.—Mr. Allen presented a carefully prepared list showing which varieties were free from or more or less affected with Woolly Aphis in New South Wales. He stated that in one district an apple would be free from this pest, whilst in another part of the State it would be badly affected.

The Chairman stated that the same trouble was found in Tasmania with regard to the variation in freedom from Woolly Aphis under different climatic conditions.

Mr. Ward said that in the northern part of Tasmania apples were badly affected in some districts, whilst in the southern portion they were particularly free from it.

Mr. Lang moved that the list submitted by Mr. Allen be received, that the other States produce similar lists at the next Conference, and that from the combined lists a list covering commercial apples for the whole of Australia be prepared. Seconded by Mr. Chilton.—Carried.

Mr. Quinn suggested that Queensland and Western Australia should be written to and asked to prepare lists of varieties of apples more or less affected with Woolly Aphis, for the above purpose.

Descriptions of Fruits.—In order to have a uniform method throughout the various States of taking descriptions of fruits, a form for this purpose was drawn up and adopted. The form appears at the end of the report.

It was also agreed that specimens should be as nearly as possible typical of varieties and of average size.

Deferred Nomenclature from 1916.

Strawberry Pippin.—Mr. Allen submitted specimens of Winter Strawberry as grown in New South Wales. There were also specimens of Strawberry Pippin from South Australia and Tasmania.

Mr. Lang moved that the Winter Strawberry, as staged by New South Wales, be accepted as correct; that the apple grown in South Australia as Strawberry Pippin is identical with the New South Wales Winter Strawberry. Seconded by Mr. Ward.—Carried.

Mr. Ward agreed to inquire and report to the Committee next year *re* Strawberry Pippin in Tasmania.

Carrington and Lady Carrington.—Mr. Allen apologised for not having specimens of these apples at the meeting.

Mr. Pescott stated that specimens of apples submitted to him about three years ago as Carrington, from trees supplied by Mr. Nobelius, were determined by him to be Thorle Pippin. For this reason he brought the matter before the Pomological Committee, and also for the reason that an apple is grown in Victoria under the name of Carrington, which is really Aiken's Seedling. He referred this matter to Mr. Nobelius, who stated that the apple distributed by him as Carrington was obtained from the Burnley Gardens.

Mr. Tucker said that the Carrington was purely a coastal apple in New South Wales. He stated that he had several acres of apples, and none of them did better with him than did the Carrington (red), which is absolutely blight-proof.

Mr. Edgell said it was not suitable for the Bathurst district.

Mr. Quinn asked if there were two Carringtons, or only one.

Mr. Adamson replied that in New South Wales there were two—the red and striped—the only variation being the difference in colour. Carringtons were absolutely blight-proof, and in his opinion the variety made a better stock than the Northern Spy, as it made stronger and far less fibrous roots. When worked, the two types—red and streaked—showed a tendency to revert to either type.

Mr. Tucker moved that the Carrington apple be recommended as a purely warm coastal apple, and not suitable for cold districts. Seconded by Mr. Adamson.—Carried.

Dutch Mignonne.—The Secretary said he had made inquiries with regard to the variety, and had ascertained that it was received in Victoria from South Australia. It was suggested that the labels were mixed at the time the trees were received, and the different varieties probably confused.

The specimens submitted from Tasmania were not accepted as true to name, and Mr. Ward was requested to submit further specimens at the next Conference.

Exhibits.

About 420 dishes of fruit were exhibited by the members, 280 being apples. The following seedlings were discussed, and were recommended for further consideration at the next meeting:—

Streamville, raised by Mr. Murphy, Aitken's Creek, Victoria.

Brown's Pippin, raised by Mr. Brown, New South Wales.

Thompson's Red Seedling. Mr. Chilton submitted specimens of this apple, which had been kept in cool store since the middle of March.

Mr. Lang moved that, as the apples showed signs of Black Spot, they should be deferred for consideration until next year, and that some other name should be suggested for the variety. Seconded by Mr. Ward.—Carried.

Granny Hunter.—Mr. Allen submitted specimens of this apple, which was grown by Mr. A. Hunter, The Penang, Gosford. They had been kept in cool store for a considerable time, and were not in the best condition. It was decided that the New South Wales Sub-committee should obtain specimens when they were in season and condition, and report on them at the 1918 Conference. It was also suggested that the name should be changed to "Penang."

Hornsby.—Specimens of an apple grown by Mr. Higgins, Hornsby, were submitted by Mr. Allen. Mr. Laffer suggested calling the variety "Hornsby," and that further specimens be obtained for display at the 1918 meeting. This was agreed to.

Ebenezer Pippin.—Mr. Allen submitted specimens of this variety, and it was decided that the New South Wales Sub-committee should obtain specimens next season, when ripe, and report on same at the 1918 Conference.

Jupp's Surprise.—Samples were submitted by Mr. Allen. As this apple was not as good as a great number of other commercial varieties, it was moved by Mr. Lang, seconded by Mr. Pescott, and agreed that it be rejected.

Shepherd's Seedling.—Specimens were submitted from the Goulburn District Exhibit at the Royal Agricultural Society's Show (New South Wales). The Committee was very favourably impressed with this apple, and it was decided that further specimens should be obtained for the next Conference. As there are a good many apples with the word "Shepherd" appearing in the name, it was suggested that the grower should select another name for the variety.

Jackson's Seedling, from South Coast District Exhibit at Royal Show.—Mr. Chilton reported that it was a good selling apple for local trade, and suggested that the name should be changed to Keira. It was decided that Mr. Allen should obtain further specimens for display, and report at the next Conference.

Croton.—Submitted by Mr. Ward. As the name was very similar to Crofton, Mr. Ward suggested that it should be changed to Ranelagh, the name of the district in which the apple was raised.

Moved by Mr. Lang, and seconded by Mr. Ward, that the name be changed to Ranelagh.—Carried.

Tasma.—Mr. Ward stated that this variety was also known as Democrat and Tasman, which caused considerable confusion amongst growers. It was decided to call the variety Tasma, and to ask the nurserymen to sell the trees under this name only.

Australian Beauty.—Submitted by Mr. Ward. Moved by Mr. Pescott that, owing to the absence of information regarding this variety, it be deferred until next season, and in the meantime Mr. Ward should make inquiries in order to ascertain if it is a sport from Ben Davis. Seconded by Mr. Laffer, and carried.

Mr. Ward submitted an unnamed seedling grown by Mr. Judd, Huon, Tasmania. He had no information regarding the apple. Mr. Pescott moved that, owing to the absence of information regarding this variety, it be deferred until next Conference. Seconded by Mr. Lang, and carried.

Lord Kitchener.—Grown by Mr. Wallace Kellaway, Huon; submitted by Mr. Ward. The specimens produced were of poor quality, and it was moved by Mr. Lang that better specimens be produced at next Conference, also that the grower be asked to change the name. Seconded by Mr. Pescott, and carried.

Franklin Belle.—Grown by Mr. Freeman, Franklin. Mr. Pescott moved that, as there were many better commercial varieties under cultivation, it could not be recommended for general planting. Seconded by Mr. Wolstenholme, and carried.

Huon Belle.—From the same source as Franklin Belle. This was a yellow, conical apple, of bright colour, indifferent flavour, and with a short stem. It was decided not to recommend it for general planting.

Mr. Ward submitted a blight-proof seedling, grown by Messrs. J. Clark and Son, Launceston. It could not be considered a standard commercial apple, and it was decided not to recommend it for general planting.

Mr. Ward submitted an apple obtained from Mr. S. T. B. Couch, representative of Two Bays Nursery, Huon. He said that fifty-one apples had grown on a lateral 18 inches long, and they were very free from Black Spot. The origin of the tree was unknown. Moved by Mr. Ward that it be deferred until next meeting, that the name be ascertained, and that inquiries be made with regard to the variety in the meantime. Seconded by Mr. Lang, and carried.

Mr. Ward submitted a seedling apple from Mr. Stewart's orchard, St. Leonards, near Launceston. It was of poor quality, and could not be recommended for general planting.

Sturmer Seedling.—Grown by Mr. Waldron, Wyena, Tasmania. Moved by Mr. Pescott, and seconded by Mr. Lang, that Mr. Ward make full inquiries with regard to this variety, and report on same at the next Conference.

Mr. Ward submitted a seedling apple grown by Mr. Widdowson, Georgetown, Tasmania. This was identified by Mr. Shoobridge as a Port Dalrymple, which has been growing in Tasmania for many years.

Two Bays Seedling.—Grown by Mr. W. G. Elliston, Latrobe, Tasmania. The Chairman stated that it was very similar to Coleman's Late Aromatic, and was possibly wrongly named. Mr. Ward was asked to make inquiries, and report on this apple at the next Conference.

Lang's Seedling.—Submitted by Mr. Lang. It was agreed that it should be exhibited and reported on at the 1918 Conference.

Seedling Pears.

Mr. Allen submitted specimens of seedling pears from Mr. Gazzard, Clergate, New South Wales. As there are many other better varieties coming in at the same season, it was decided that this one could not be recommended for general planting.

Mr. Allen said he would obtain specimens of a seedling from Packham's Triumph for next Conference.

Judd's Beurre.—Raised by the late Mr. Judd, Franklin, Tasmania. It was decided that this pear was not of the best quality, and could not be recommended for general planting.

Consideration of General Exhibits.

APPLES.

Duke of Wellington.—Grown at Mount Keira. This apple is of nice appearance, somewhat like Yates in shape, but of better colour. It is a heavy cropper, and said to be blight-resistant.

It was decided that the New South Wales Sub-committee should make investigations with regard to this variety, and report at the next Conference.

Red Five Crown.—Obtained from Goulburn District Exhibit at Royal Show; raised by Mr. Best, Taugmangaroo. This is a bright-streaked apple, with the colour extending far into the flesh; is very similar to Coleman's Late Aromatic (Tasmania).

New South Wales Sub-committee to investigate, and report at 1918 Conference.

Nigger Head.—Obtained from Goulburn District Exhibit at Royal Show. This apple is very dark—much darker than Hoover, and much like Arkansas Black.

New South Wales Sub-committee to investigate, and report in 1918.

Goulburn Beauty.—From Goulburn District Exhibit at Royal Show. An apple of good colour, appearance, and flavour. To be kept in view by the New South Wales Sub-committee, and reported on at the 1918 Conference.

Beauty of Australia.—Grown at Mount Keira. Determined to be identical with the South Australian apple of the same name.

Mr. Chilton submitted an apple grown by Mr. Franks, Pennant Hills, and supposed to have been originally obtained from Tasmania.

Moved by Mr. Lang, and seconded by Mr. Chilton, that it was identical with Dunn's Favourite.

Mr. Allen submitted specimens of an apple grown by Mr. Wollard, Moorilda. The specimens resembled Cooper's Market, but could not be identified by the Committee. Mr. Allen was asked to obtain further specimens for next Conference.

Two varieties of apples grown by Mr. Larsen, Stonehenge, were submitted by Mr. Allen. One was a large greenish-yellow apple, very subject to Bitter Pit, and badly shaped. It was not considered worth growing for commercial purposes. The other, a large yellow apple, was identified as Gloria Mundi.

Specimens of an apple planted at Bathurst Experiment Farm as Blondin were submitted. It could not be identified, and it was decided to submit specimens at the next Conference.

Specimens of an apple (supposed to be a seedling) were submitted from Mr. F. R. Auberson, March, near Orange. It was not identified, and Mr. Allen was asked to submit further specimens at the next Conference.

Lady Hopetoun.—Grown by Mr. W. Grunsell, Parkesbourne. It was decided to have further specimens at next Conference, and also to have specimens of the same variety from Victoria.

Tetofsky.—Grown by Mr. A. Hunter, The Penang, Gosford. This was determined by the Committee to be the Russian apple Tetofsky. It is of poor quality, and is not recommended for planting.

Loddington (described as imported).—Grown by Mr. A. Hunter, The Penang, Gosford. This variety was determined to be true to name, but is not recommended by the Committee for general planting.

Garibaldi.—Grown by Mr. F. R. Auberson, March, near Orange. Decided to be true to name.

Fall Beauty.—Submitted by Mr. Allen. Name possibly correct, but could not be recommended for general planting. Grown by Mr. A. Hunter, Gosford.

Mr. Allen submitted an apple forwarded by Messrs. Searl & Co., Sydney. As only one specimen was submitted, it could not be identified.

Mr. Chilton submitted an apple obtained from Mr. J. A. Wheatcroft, Dunolly, Tasmania, as Alfriston. The secretary stated that the same apple had been submitted to Conference in 1914, and was identified as Flower of Kent. It was decided that Mr. Ward should obtain all possible information with regard to this apple, and also submit specimens at the next Conference; Mr. Lang also to submit specimens of Flower of Kent, as grown at Harcourt, Victoria.

Mr. Chilton submitted another apple obtained from Tasmania. He had no information with regard to the locality from which it came, or of the variety. It was apparently a seedling, and could not be identified by the Committee.

Blenheim Orange.—Mr. Ward submitted specimens of an apple grown under this name by Messrs. J. Clark and Son, Launceston, Tasmania. It was deferred until 1918 Conference, when Mr. Ward would submit further specimens.

Specimens of an unnamed variety resembling Striped Beefing were submitted by Mr. Ward. The specimens were inferior to this variety, and could not be recommended. Grown by Mr. C. Ling, Penguin, Tasmania.

Further specimens from the same grower were submitted by Mr Ward. These resembled Rymer. It was decided to bring this variety up again for consideration at the next Conference.

Specimens of a late apple were submitted by Mr. Ward. These were grown by Mr. H. Stapleton, Youngtown, Tasmania, and are very similar to Majetin. It was decided to have further specimens for consideration at the 1918 Conference. This was considered a good variety and well worth following up.

Mr. Ward submitted another variety from the same grower. These were very much like Dutch Mignonne. Further specimens are to be submitted and discussed at the 1918 Conference.

Specimens of a variety grown as Kirk's Perfection, by Mr. C. White, Beaconsfield, Tasmania, were submitted by Mr. Ward. They were identified by the Committee as Moss' Incomparable.

Mr. Ward submitted specimens from Mr. D. Weston, Launceston. These were somewhat decayed and could not be identified. They were probably Twenty Ounce. Mr. Ward is obtaining further specimens for next Conference.

PEARS.

Mr. Chilton submitted samples of pears grown at "Wenona," Capertee, as Beurre de Capiaumont. They could not be identified as this variety. They were very similar to Colmar. Mr. Chilton is to obtain further specimens for next Conference.

Mr. Chilton also submitted specimens of pears grown by Mr. Perrett, Turramurra. These were identified as Garber's Hybrid.

Mr. Allen submitted specimens grown at Yanco and Bathurst Experiment Farms as Josephine de Malines, the tree of which originally came from Victoria. They were not identified by the Committee as this variety. They were well thought of, and Mr. Allen was asked to submit further specimens at the 1918 Conference.

A pear grown by Mr. Peacock at Kelso, as Callabasse Bosc, was determined to be Callabasse Grosse.

Specimens of pears grown by Mr. R. L. Richmond, Glenlusk, Tasmania, as Easter Beurre, were submitted by Mr. Chilton. They were similar to Flemish Beauty, and further specimens will be exhibited by Mr. Ward at the next Conference.

Specimens of another variety from the same grower were submitted. These were of good quality, and Mr. Ward was asked to obtain all information with regard to them, also further specimens for the 1918 Conference.

Mr. Chilton submitted a pear grown by Mr. T. P. Lock, Premaydena, Tasmania. This could not be identified, and Mr. Ward was asked to obtain further specimens for next Conference.

Another pear was submitted from the same grower, and it was also deferred until next year.

Mr Ward submitted pears from Mr. C. R. Burnside, Deviot, Tasmania. These were identified as Souvenir du Congres. Further specimens are to be submitted at the next Conference, and Mr. Allen will also exhibit some of the same variety.

A pear grown by Mr. C. Perrin, Launceston, was submitted by Mr. Ward. As only one specimen was exhibited, it could not be identified, and Mr. Ward was asked to obtain further specimens for next meeting.

Mr. Quinn submitted specimens from a fifty-year-old tree in the Government Orchard, Kybyolite—a cool district. These were determined to be Beurre Rance.

Further specimens from the same orchard were out of condition and could not be identified.

Small russet pears from the same source could not be identified, and were considered too small to be worth consideration.

Other large specimens from the same orchard were deferred for consideration until the 1918 Conference.

Mr. Quinn promised to obtain better specimens of the above varieties for next Conference.

Mr. Laffer submitted specimens from the Mylor Orchard, South Australia. These were considered to be very similar to Nec Plus Meuris of Van Mons. Mr. Laffer was asked to submit further specimens at the next Conference, when specimens of the Nec Plus Meuris would also be exhibited.

Mr. Laffer submitted specimens grown by him at Belair, South Australia, which, it was suggested, were Lawrence. He was asked to submit further specimens next year, when the variety Lawrence would also be displayed.

Another pear submitted by Mr. Laffer from the same orchard was decided to be Conference.

Change of Name.

At previous Conferences the Committee decided, for various reasons, to make changes in the nomenclature of certain fruits. The following is a list of the changes made :—

APPLES.

Old Name.	New Name.
Five Crown Pippin	London Pippin
Dumelow's Seedling	Dumelow
Democrat	Tasma
Dunn's Seedling	Dunn's Favourite
Munroe's Favourite	
Stewart's Seedling	Stewarts
Schroeder Apfel	Schroeder
Emperor Alexander	Alexander
Trivett's Seedling	Trivett
Mellon's Seedling	Dunolly
Yapeen Seedling	Yapeen
Yeate's Nonpareil	Gowar
Stayman's Winesap	Stayman

PEARS.

Old Name.	New Name.
Williams' Bon Chretien	Williams
Bartlett	
Duchess	
Napoleon	Vicar of Winkfield
Vicar of Winkfield	
Giblin's Seedling	Giblin's Nelis
Kieffer's Hybrid	Kieffer
Harrington's Victoria	Harrington
Laffer's Nelis	Laffer
Laffer's Bergamot	

Mr. Ward referred to the Tasma apple being sold in Tasmania as Democrat. He moved that the secretary write to the nurserymen in Tasmania and Victoria, asking them to adopt the name of Tasma as decided upon by the Committee. Seconded by Mr. Lang, and carried.

At the 1917 Conference, the names of two fruits only were changed. These were :—

(*a*) The name of the Tasmanian apple Croton was changed to Ranelagh. The name Croton is very like that of the apple Crofton, which is largely grown in Tasmania, and the name Ranelagh was selected as being the district in which this seedling was raised.

(*b*) *Pomme de Neige.*—Mr. Allan moved that as this apple was originally called "Fameuse," after the village in Quebec where it was raised, the question of re-naming the variety should be considered. Seconded by Mr. Ward.—Carried.

After considerable discussion, the following motion was moved by Mr. Allen, seconded by Mr. Ward, and carried :—

> That the name of the apple known as Pomme de Neige be changed to Fameuse; that in his report the secretary give a resumé of the history of this apple, stating the reason why the name has been changed.

NOTE ON THE APPLE FAMEUSE.

The apple which is catalogued and so well known throughout Australia, Pomme de Neige, is correctly called Fameuse. It is known and recognised only by this name in America, its country of origin; and following on the decision of the Australian Committee to adopt nomenclature of other lands, the correct name of Fameuse has now been adopted.

The history of the Fameuse is somewhat obscure, but it is generally supposed to have been raised at Fameuse in Canada, from seed brought to Canada from France prior to the year 1700.

Among the early references to this apple as Fameuse, is one found in Forsyth's "Treatise on the Culture and Management of Fruit Trees," the first edition of which was published about 1800. Forsyth there records that this apple was brought from Canada by a Mr. Barclay.

The first reference to the apple as De Neige or Pomme de Neige occurs in American as well as English horticultural literature twenty or thirty years later. This name, meaning Snow Apple, was given in reference to the snowy whiteness of the flesh.

There was another apple cultivated in Europe as far back as 1628 which carried the name of Pomme de Neige. This was cultivated by the old fruit breeder Le Lectier and recorded by Leroy. Leroy said that this certainly was not the Pomme de Neige of Canada.

The European Pomme de Neige is catalogued by Diel, after whom the pear Beurre Diel is named, and it is certainly not the Canadian apple. Thus confusion had early arisen, and Hogg, as far back as 1851, tried to overcome the difficulty by calling it De Neige, saying at the same time, "This is not the Pomme de Neige of Diel."

On account of this confusion, but more on account of the fact that the apple is now universally known in its home of origin by its original name, Fameuse, the Committee decided to recognise this name in preference to the French name.

Approved Names.

At the 1913-14 meetings the following names were approved of :

APPLES.

Adam's Pearmain
Alfriston
Beauty of Bath
Ben Davis
Champion
Cleopatra
Cox's Orange Pippin
Duke of Clarence
Dumelow
French Crab
Gascoigne's Scarlet
Granny Smith
Gravenstein
Jonathan
King of Pippins
Lang's Best
Lane's Prince Albert
London Pippin
Lord Daly
Lord Suffield
Lord Wolseley
Maiden's Blush
McIntosh Red
Peasgood's Nonsuch
Perfection
Pomme de Neige
Prince Alfred
Reinette de Canada
Rokewood
Rome Beauty
Rymer
Scarlet Nonpareil
Shepherd's Perfection
Shorland Queen
Statesman
Stone Pippin
Sutton.
Twenty Ounce
Wagener
Warner's King
Wealthy
Winter Strawberry
Worcester Pearmain
Yates

PEARS.

Beurre Bosc
Beurre Capiaumont
Beurre D'Anjou
Beurre Diel
Beurre Superfin
Clapp's Favourite
Conference
Duchess D'Angouleme
Durondeau
Doyenne du Comice
Elizabeth Cole
Giblin's Nelis
Glou Morceau
Howell
Josephine de Maline
Le Lectier
Madam Cole
Packham's Triumph
Packham's Late
Thompson's
Urbaniste
Vicar of Winkfield
Winter Cole
Winter Nelis

Rules for Fruit Nomenclature.

In regard to fruit nomenclature, the following rules are considered by the Committee as urgent :—

1. That the names shall be as simple as possible.
2. That wherever possible, one word only should be used as a name.
3. Duplication of names, or names possessing strong similarity, is to be avoided.
4. That such words as "seedling" and "hybrid" be abolished from Australian Pomology as far as possible.
5. That priority of name, naming or of origin, have preference wherever possible.

General.

It was decided that the next Conference be held in Adelaide, South Australia, commencing on or about 15th April, 1918.

After votes of thanks to the Minister and to the Under Secretary and Director of Agriculture, New South Wales, for hospitality extended at Bathurst, the Conference closed.

Form for Describing Apples and Pears.

THE POMOLOGICAL COMMITTEE OF AUSTRALIA.

APPLES AND PEARS.

(Specimens and Information for Pomological Records.)

Section I.

The accompanying specimens of..
were obtained from Mr. ....Orchard..............
at..Grown on...............................Soil.
Average Annual Rainfall..

Suggested Name..
Origin .... Age of tree........................
The original tree is still growing at..
Age of tree from which samples were taken ....
Worked on..Stock
Habits of Growth...
Description of Bark.............................Leaf.......................
Blossoming Date..
Cropping Characteristics...
Date of Ripening ....
Keeping Qualities..
Subject to what diseases or pests ....
Any other information...

(Signed) ....

Date.

Section II.

(To be filled in at Head Office.)

Form..
Size (in inches).......................high.............................wide
Colour of skin ....
Dots, markings, or russets..
Eye.......................................Basin......................................
Segments..
Stalk......................................Cavity....................................
Stamens.................................Tube.......................................
Core.......................Axile...............................Abaxile
Flesh texture........................... Colour.................................
Flavour and quality...
Used for dessert.................................. Culinary.......................

AFTER consultation with the Department of Agriculture, the Principal Librarian, Sydney, has decided to establish a library for the circulation of agricultural literature amongst the various branches of the Agricultural Bureau. Several sets of about thirty books, each dealing with all departments of agriculture and allied subjects, are now available for loan to branches, and secretaries whose members desire to participate in the advantages of the circulation should make application to the Principal Librarian, Public Library of New South Wales, Sydney.

Poultry Notes.

AUGUST.

JAMES HADLINGTON, Poultry Expert.

THE hatching season is now in full swing and poultry keepers will be anxiously watching both incubators and brooders, knowing that the number of chickens brought out this month is an important factor in the determination of the egg-production of next autumn and winter—the time when, of course, high prices are expected. It is to this month's hatching that the regulation points, which provides that pullets entering the laying competitions shall be at least seven months old, this having been found the best month on the average for producing good layers.

The brooding of chickens was dealt with last month, and the information there presented, if faithfully acted upon, should produce good results, other things being favourable. Feeding is perhaps the next important factor to bring under notice, and a little space may be profitably devoted to the matter now.

Feeding Baby Chicks.

At the end of thirty-six or forty-eight hours is quite soon enough to feed the newly-hatched chicks, but water should be put before them immediately they are put into the brooder.

Nature has made provision for the sustenance of the newly-hatched chick by passing the yolk of the egg into the abdomen just previous to emergence from the shell. If chickens are fed too early the yolk may not become entirely absorbed, with the result that changes take place which frequently produce either diarrhœa or pasting up of the vent. It may, however, be mentioned that this is not the only cause of non-absorption of the yolk. Very often weakly chickens—whether the weakness is due to faulty incubation or to other causes—fail to properly absorb the yolk, and after hatching out apparently quite clean, they linger on, sometimes for a week or two, and eventually die. Post-mortem examination will show the cause of death to have been as stated. Hundreds of weakly chickens, which have no chance of living, are hatched in this way.

Many of the old time notions of feeding chicks with hard-boiled eggs &c., are falling out of use, and simpler methods are being substituted. There is, perhaps, no better food for baby chickens for the first two days than rolled oats of an ordinary breakfast quality, to be followed by the class of food indicated later.

Feeding Chickens.

If not complicated by the many fads and theories that are current, feeding chickens successfully is a simple matter. Unfortunately the beginner, and some whose experience should deter them from following anything but what has been well proved in practice, are somewhat prone to be swayed by unsound advice and doubtful experiments. They would be well advised, however, to follow methods that are giving satisfactory results, and if an experiment is to be tried to confine it to small dimensions, so that the whole of the flock will not be jeopardised.

A great deal more depends upon sound methods of feeding than is generally realised. We must not only feed to keep chickens alive and to prevent gastric troubles (upon which so much stress is sometimes laid), but we must feed with the object of obtaining the best possible development. This is a phase of feeding that very often does not receive sufficient consideration. Good steady growth from the shell to maturity, and an absence of checks not only ensures the most economical use of the food, but also tends to develop a much larger and stronger bird. Neither the chemical value of foodstuffs, nor even the digestible constituents taken alone, is a safe basis upon which to build a ration. Other considerations enter into the calculation, such as variety and palatability. Any ration, however well balanced, that ignores these vital factors will fail to produce satisfactory results.

It will therefore be seen how complicated the feed problem becomes when beaten tracks and practical experience are departed from. Once these facts are realised, the wise poultryman will tread the paths of experimentation warily. In regard to scientific feeding in general, even food chemists are not slow to emphasise the fact that the only reliable guides to the true value of a ration are the results obtained from it. Then, again, foods, even though they contain the same elements, may be appetising or otherwise, according to the manner in which they are fed; the practice of feeding dry mash to chickens is a case in point. Dry mash is certainly not as appetising as a properly mixed semi-wet mash; this can be verified by noting how chickens will leave dry mash and greedily eat up wet mash—provided it is not too wet.

Dry Mash Unsuitable for Chickens.

Whatever advantage there may be in feeding dry mash to adult fowls, I am convinced after careful observation that attempts to raise chickens on it are fraught with very grave consequences to the poultry industry. The results arising from the method are so insidious that it sometimes takes years to convince its devotees of its failure to produce satisfactory results. A small loss in development from one year to another is often not recognised until irreparable damage has been done to the flock; but some poultry farmers are fortunately finding this out. Dry feeding as a system is similar to intensive methods in its effects, producing a falling off in size and stamina. At the same time dry mash feeding should not be confused with the feeding of dry grains or of chicken mixtures; the last is far preferable to dry mash, and, of course, can be fed in hoppers in the same way. Experience teaches that to get chickens to eat the maximum amount of food we must supply at least a portion of that food in a palatable and easily digested form, and perhaps the nearest we can get to that is a semi-wet mash.

A Proved Method.

The feeding method at Hawkesbury Agricultural College, and on many big commercial farms in this State, is to give at least two-thirds of the whole of the ration for chickens until they are, say, 6 or 8 weeks old, in the form of semi-wet mash mixed with milk, the balance being chicken mixture, mostly fed towards evening. The method of mixing this semi-wet mash is to scald the proportion of bran (generally about one-third) with hot milk; this portion will then be like a bran mash. Sufficient pollard is then added to work it up into a crumbly consistency, and the mash is then fed in troughs. Mixing twice per day is quite sufficient to ensure its being in a sweet, wholesome condition. Enough can be mixed for hundreds of chickens in about ten minutes, so that the saving of labour in the use of dry mash for chickens is not so great a consideration as might appear. There is, of course, the little time taken up in actually giving the food round, but what successful operator in rearing chickens would not require to visit and regulate matters in connection with his charges more times a day than this method involves?

In a business so full of detail as that of poultry-raising it is laudable to aim at saving every minute, and to cut out every useless movement; but it will not pay to sacrifice anything in the development of the stock for so small a consideration, because upon development depends the success of the business.

General Considerations.

Careful and systematic feeding is also necessary to obtain the best results. Chickens should not only be well fed, but they should be induced by considerations of palatability to take the largest amount of food, in order that there may be developed, as a constitutional character, a capacity for the consumption and assimilation of large quantities of food. This is quite essential to the maintenance of a high standard of egg-production when adult age is reached.

Chickens should never be allowed to go too long without food, nor should they become surfeited with it.

After leaving the brooders, the number of times a day at which the chickens are fed should be gradually reduced, say, to four times at 10 weeks old, afterwards to three times daily, and later on to simple adult feeding. The observant poultry keeper will soon find from experience how many times per day feeding is necessary, for he will learn from the chickens themselves.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bimbaya.

A meeting of the above branch was held on 7th June, at which a paper, entitled "Profitable Pig-keeping," was read by Mr. A. Irving, and an interesting discussion followed. The following is a summary of the paper:—

PROFITABLE PIG-KEEPING.

It has been ascertained that for every 100 lb. of live weight of an ox the stomach weighs 3 lb., of a sheep 3 or 4 lb., but of a pig only ·66 lb. It is quite evident from this that the pig is not so well adapted to feed on light foods such as grass or hay as the sheep or ox, and, therefore, if profit is aimed at, it is necessary to keep the pig in closer confinement than the ox or sheep, and to feed him on richer food. From this it would appear that the pig was a most unprofitable animal, but there are other circumstances which modify this conclusion. Pigs will eat up a great lot of food which otherwise would be wasted. For instance, we cannot in any way utilize the refuse from the house and dairy so advantageously as by giving it to swine. The main features to keep in view are warmth, cleanliness, and regular feeding.

One of the most desirable qualities of a pig is that he should have a good appetite. The more he can eat and digest the more pork he will produce. A pig can be compared to a flour mill. In a flour mill we have the engine which drives the stones, and the other machinery which takes the bran and other inferior products out of the way. The pig is the mill and engine combined, and is a means whereby corn can be turned into bacon. Now, if we furnish merely enough corn to run the machinery, and put no grain in the hopper, we lose not only the use of the mill but all the grain used as fuel. If we kept the machinery running day and night, and the mill supplied only half the time, it would not be considered good management. In the case of the pig, the machinery must run at full speed all the while; therefore, to feed him for profit he must have all he can eat all the time.

For rearing young pigs there is nothing better than the waste product of a dairy farm. If it was not for the pig, large stores of food would have to be wasted, as there are times on dairy farms when men find it troublesome to get rid of their surplus skim-milk. Pigs also come in handy for eating up scraps and stunted vegetables. The pig is the medium whereby almost any farm produce (when it is too cheap otherwise) can be turned into a very profitable asset.

Pigs require to be well housed. One of the main points is to keep pigs comfortable and warm by building for them good houses, and seeing that they have plenty of good, warm bedding. The main points, I consider, are good breeding and having pigs selected from good healthy families, as it is no use trying to make any profit out of pigs which have become degenerated through inbreeding, or have become unhealthy through ill-treatment.

Buckaroo.

A branch has recently been formed at this place, and the following office-bearers have been elected:—Chairman, Mr. J. D. Mason; Vice-Chairman, Mr. A. Huxley; Treasurer, Mr. S. Elphinstone; Hon. Secretary, Mr. P. J. Crowley.

Comboyne.

There was a good attendance at the meeting on 5th June, when Mr. Brereton, Assistant Fruit Expert, gave a demonstration of pruning. In the evening he also gave a lantern lecture, which was much appreciated by the audience.

An interesting competition for the production of the best essay on Mr. Brereton's lecture was arranged among the pupils from the schools, of whom there were a large number present.

At a meeting on 4th July, a lecture on maize culture, illustrated with lantern slides, was given by Mr. H. Wenholz, B.Sc., Inspector of Agriculture. The evening was much appreciated by the members present, and proved very instructive.

Coradgery.

A meeting of this branch was held on 19th May, Mr. W. E. Tayler presiding.

Correspondence was received from a number of other branches, approving the suggestion for the farmers' free gift of wheat to the British Government.

Mr. Kelk having taken up the duties of Hon. Secretary, Mr. J. Clatworthy was appointed Vice-Chairman in his stead.

A paper was read by Mr. Kelk, from which the following is taken:—

SHEEP ON THE FARM.

The big profits now being returned by sheep suggest the advisability of considering the position of sheep on the farm with more care than we have been accustomed to. On a mixed farm, there was a time not far distant when sheep were regarded as of only secondary importance. They supplied the farmer's household with mutton, they returned some money for their wool after shearing, and perhaps a few trucks of fat lambs returned some more. Whilst these returns were, no doubt, fully appreciated when they came to hand, yet generally speaking, the sheep were left practically to take care of themselves. To-day the conditions are quite different, and it behoves every farmer to do all he can to ensure the maximum return from his flock. This means giving them more thought and more care. With a flock of ewes in lamb to Lincoln rams, bought, say, in February at 35s. or even higher, the aim should be to save every lamb and every ewe, and to see that the ewes produce a fleece of the highest possible value. Amongst the opposing factors in the first two cases, the principal are the troubles attending parturition and blow-flies. The percentage of deaths among ewes lambing to Lincoln rams will be seriously high if the flock is neglected, but with constant care and attention during the whole period of the lambing there should be few losses, if any. Just as closely, too, let the farmer watch for signs of blow-flies, and if evidence of attack appear the ewes should be yarded and the stricken ones attended to. Some people are perhaps averse to yarding ewes in the midst of lambing, but with proper care this can be done without damage, even every day. If a ewe with a young lamb succumbs to maggots the lamb will also surely die, and the loss is likely to be somewhere about £3. As to the fleece, farmers might well give this feature of the business a little closer attention. At the outset they should strive to buy ewes carrying wool of the best quality; this involves, however, giving them a chance to do their fleeces justice. Perhaps of first importance under this head comes the absolutely ruthless destruction of the Bathurst Burr; that means cutting the plants before the burrs have formed. Cutting them too late is mere waste of time, unless they are gathered up and burnt. Secondly, the flock should be kept in the best possible condition of health, and to this end salt is a potent factor. Rock salt at present is, of course, too dear to buy; but the other, crushed and sold in bags, is always better. This should be placed in troughs, roofed with, say, old roofing iron or bark, and the supply regularly kept up, as the sheep will only take what they require, and this is more at some times than others. Avoid letting the sheep go to the trough for salt and finding it empty. A third matter worth considering is the provision of adequate shade. Frequently in summer time sheep are turned in to cultivation paddocks without a scrap of shade in them, and are there left to endure, day after day, and week after week, the rays of our blazing summer sun. The discomfort, to put it mildly, suffered at such times is not without its bad effect on the fleece. The erection of shades, such as bough sheds large enough to accommodate any number of sheep likely to be put into the paddock, suggests itself. It is not sentiment, but practical economy. The matter of dealing with fly-blown sheep at the earliest possible moment has been mentioned. It may be added that not only has the life of the ewe to be considered, but the loss of wool due directly to damage by the maggots and indirectly to the loss of growth on the whole fleece caused by the fevered and unhealthy condition of the skin, and the acute physical pain. Any expenditure of time and labour in this direction will not only be repaid in cash, but also in the satisfaction arising from the knowledge that all is well with the flock. Ewes generally lamb at one of the busiest times for the wheat-grower, and help is admittedly scarce, but a wheat farmer may find, even at the busiest time, that an occasional half-holiday for his teams in the interests of his sheep will prove highly remunerative.

DISCUSSION.—Mr. W. E. TAYLER agreed as to the necessity for shade, and that it was too often overlooked. He advocated the crutching of ewes, considering it quite as important as the shearing. This should be done as nearly as possible one month before lambing. He had experienced practically no trouble from blow-flies after crutching, the exceptions being where the crutching had been badly done.

Mr. MARRIOTT agreed that the ruling values of sheep certainly demanded that more attention should be paid to the ewes and lambs than had been the general practice hitherto.

The monthly meeting was held on 16th June.

The subject set down for discussion was repatriation, and a letter that had been written to the Minister for Lands was submitted to the meeting as a basis for conversation. After a full discussion the meeting unanimously voted its endorsement of the suggestions contained in Mr. W. E. Tayler's letter.

Cordeaux-Goondarin.

A meeting of this branch was held on 6th June, at which Mr. Edward Rees read a paper, entitled "Pests which the fruitgrower has to contend with, and how to combat them."

ORCHARD PESTS.

The subject was roughly divided into four parts: Chewing insects, sucking insects, fungous diseases, and the sprays that have been found most effective. The futility of the bandaging method for prevention of codlin moth was pressed, as more than a third of the crop was worthless. Mr. Rees and his father commenced spraying with arsenate of lead three years before it became compulsory, and from the first an improvement was noticed, until now 95 per cent. of the fruit was sound and free from moth. Another point of interest was the control of fungous diseases, and especially of brown rot on peaches. The trees sprayed with lime-sulphur showed more damage than those sprayed with atomic sulphur.

The discussion proved very interesting, many valuable suggestions being brought forward.

Mr. R. BROWN brought forward the matter of combined sprays, pointing out that in experiments they had not been found invariably satisfactory.

It was suggested by other speakers that this was probably the fault of the mixing, as mixed spraying had undoubtedly proved a great success and a time-saver. It was also pointed out that it is necessary that the orchardist should give more attention to the scientific side of the business in the compounding of sprays, including the proper testing by hydrometer and other means.

The variation of commercial sulphate of copper was considered a fruitful source of failure.

The members present were hospitably entertained by Mr. and Mrs. Cram with refreshments.

Cotta Walla.

A meeting was held on 5th June, at which Mr. T. A. Howard read a paper, from which the following is taken:—

SORREL.

Sorrel is undoubtedly the commonest weed in the cultivation land of this district; there is hardly a paddock where more or less of it is not found. It is also very noticeable in some of the pasture land.

I think most farmers realise the great advantage of clean crops, and that weeds reduce both the quantity and quality of the crop. The presence of weeds in hay crops can easily be detected by experienced men, even after they have been cut into chaff, and always results in a reduction of price. Foreign matter in grain is a still more serious matter, for it makes it almost unsaleable, and anyone who sows dirty seed is in for a bad time. As regards the reduction in the yield of the crops, the truth of that old saying, "the more weeds the less crop," is proved every time it is tested, for the simple reason that the weeds rob the plants of moisture and of the food properties of the soil, and also cause crowding of the plants.

Of the many different weeds found in cultivation land, I think sorrel is the hardest to exterminate, for it grows from the root as well as from the seed. As to the most practicable methods of exterminating this plant, we will first consider the case of a paddock containing a lot of sorrel roots. The first ploughing of the land should be in the summer months, as hot, dry weather is essential; the disc plough is preferable for this operation, as it cuts the roots to pieces and places a fair percentage of them on the surface. The spring-tooth cultivator should next be run through the land within a week or two of the ploughing; this is a splendid implement for raking and combing out the roots and bringing them to the surface, where exposure to the sun soon accounts for them. A second cultivating is advisable a couple of weeks later. Of course, it is not possible to work all the land in the summer, and some paddocks have to be dealt with in the season when the land is wet and the sun's heat insufficient to kill the roots. In these cases I think the mould-board plough should be used to turn in as much of the weed as possible. This method will not kill the roots, but it will check them and give the crop a fair start.

The best way to deal with land where the sorrel has seeded the previous year is, after ploughing to work the surface at regular intervals with the cultivator or harrow; each working will kill the young plants that have germinated and will cause more seed to germinate.

Idle cultivation land should be heavily stocked with sheep in the spring months, so as to prevent sorrel going to seed; sheep are very fond of it, and thrive well on it while it is in the leafy stage. Fallowing and potato-growing are also successful methods of destroying the weed. The thorough working of the land, which is essential to potato-growing, causes the seeds to germinate and the subsequent workings easily destroy the young plants.

Another important thing that farmers should watch very carefully is the seed they sow. I have seen people sowing grain (generally oats) that was of a splendid sample, but on close inspection it was found that they were unconsciously sowing a fair amount of sorrel seed as well. It is certain that rubbish gets into the land all too quickly without sowing the seed of undesirable plants. No doubt there are times, such as the showery spring months and exceptionally wet winters, when even the most careful farmer cannot keep his land free from it; but I think if farmers paid more attention to the working of land at suitable times, and to the class of seed sown, this weed would not have the hold of cultivation land that it has at present.

A meeting was held on 3rd July, thirteen members attending. Mr. O. A. Storrier read a paper, from which the following notes are taken:—

SELECTING DAIRY COWS.

The most important point in dairying is the selection of the cows. In my opinion there are four points that must be carefully considered before anyone can give a definite opinion as to the most suitable breed. These points are:—

(1) The cow most suitable for the climate of the district.
(2) The cow that will produce the largest quantity of milk.
(3) The best producer in butter-fat.
(4) The sale of the progeny.

Dairymen are likely to judge a cow by butter alone, which, no doubt, is a good fault, but we must also consider the value of the skim-milk for the rearing of pigs and calves.

I consider Milking Shorthorns are cows that best fulfil these requirements. They are a good handy type, and heavy milkers. Although they may not test as high as the Jersey, still they have other good qualities that make up for that. For instance, the calves are always more saleable, for, as a rule, they are of larger frame, and very good colours, principally reds and roans. The cow herself is generally a large-framed animal, and should misfortune overtake her in udder troubles, she can then be dried off and fattened, and will realise a high price for beef, or she will sell to advantage as a store cow.

DISCUSSION.—The general feeling of the meeting was that the Shorthorn was the most suitable breed, but the claims of the Jersey and Ayrshire breeds were also strongly supported.

Cunningham.

A meeting was held on 5th June, which was attended by twelve members. Mr. B. J. Stocks read a paper on mixed farming.

MIXED FARMING.

The problem we have to face to-day is how to put our land to its most productive purpose. To depend solely on wheat, as a good many of us have been doing, is not a paying proposition, and we must turn attention to side lines that will work in with wheat. In a district of fairly reliable rainfall, raising crossbred lambs for the market is likely to be profitable. Given a little practical knowledge and good management it would be better than wheat last season. Pigs can be another source of revenue. A few good sows well mated, and handy paddocks with pig-proof fences, return handsomely, and as a side line they are within the reach of small farmers. Poultry well managed will also return well. The same applies to a few well selected and well-cared-for cows; while every farmer should rear his own horses, both light and heavy. Stock bred on the place and handled carefully when young do better, as a rule, than animals procured in the open market. An orchard consisting of a few trees of each variety properly attended to is profitable, and every farmer should grow his own vegetables. Fodder should be grown and conserved for horses, cattle, early lambs and pigs. Such a venture requires extra care and judgment, however, to see that none of the various sections is overdone, and also to keep in touch with the market requirements in each department.

A meeting of the above branch was held on 29th June, when a paper was read by Mr. H. M. Hall, and a discussion followed.

PIG-RAISING IN CONJUNCTION WITH MIXED FARMING.

In the first place it was necessary to have good accommodation (handy, clean, convenient sties) adjacent to a lucerne paddock if suitable land was available, as lucerne goes a long way towards making a pig profitable. When the young pigs were weaned the sows would do well in the lucerne paddock. A well-bred boar was necessary; mated with ordinary plain sows, he would produce good marketable pigs. Culling the sows each season was recommended, and a first cross between Tamworth and Berkshire was favoured. Good paddocks were essential, otherwise the pigs would become a nuisance. Pigs were considered by Mr. Hall most profitable as baconers, and he did not recommend going in for pig-raising heavily. A few pigs well fed and managed were a source of revenue to the farm. Pigs did well in the stubble paddocks after the crops were harvested.

DISCUSSION.—Mr. A. E. OUGH did not consider it paid to feed pigs. It was more profitable to run them on grass and lucerne, and sell them as stores.

Mr. BARKER, Sen., considered a few pigs an asset on a farm, as nothing then went to waste.

Mr. B. J. STOCKS contended that the pig, properly managed, was a very profitable side-line to mixed farming. After testing the Sydney market, he considered the most profitable pig was the porker, 70 to 90 lb. in weight. Melons, pumpkins, and turnips could be grown as well as lucerne. He put rape next to lucerne, as it grew into good feed when the lucerne was dormant in the winter months.

French's Forest.

A meeting was held on 5th July, when only general business was dealt with.

Garra-Pinecliff.

A meeting of the above branch was held at Mr. Robards' residence on 5th July, when there was a good attendance of members. A useful discussion took place on information gleaned by various members from the books on agricultural matters received through the branch.

Inverell.

The question of noxious weeds and their control was discussed by the Inverell branch at its last meeting.

Mr. Ditzell, who presided, read a paper, from which the following paragraphs are taken:—

NOXIOUS WEEDS OF THE INVERELL DISTRICT.

The weeds that give the farmer most trouble may be named thus:—(1) Bathurst Burr, (2) Cockspur Thistle, (3) Variegated Thistle, (4) Californian Poppy, (5) Amaranth, (6) Black Oats, (7) Summer Grass, (8) Pigeon Grass, (9) Bare Poles, (10) Zinnia, (11) Couch Grass, (12) Convolvulus, and (13) Noogoora Burr.

The weeds named in this list are, generally speaking, detrimental, in that they grow on fallow land, thus necessitating extra cultivation. When growing amongst wheat and similar crops, they usurp the place of the crop plant, thus reducing the yields; while in the case of crops planted in rows, such as maize, much extra intertillage is needed to keep them in check. The usual modes of control are grazing with stock on stubble and fallow land, and cultivation.

Bathurst Burr.—This is one of the worst weeds in the north-west. Farmers and graziers alike expend much time and money in combating it. It is especially bad, inasmuch as the seeds retain their vitality in the soil for a great number of years. It is an exotic, having been introduced into Australia from South America many years ago. In cultivation paddocks it grows profusely during the summer months; and with maize crops gives endless trouble during good seasons, the usual farm implements having little effect upon it if it is anyway forward. It is also found growing plentifully on roads and bare land. The seed is disseminated by different agencies. Animals carry the seeds on their bodies, winds transport it by rolling broken plants over the ground, and water plays a big part in seed distribution. Wool is depreciated in value owing to the presence of the seed. Good wheat crops can be grown after a heavy crop of burrs, the roots of which open up the soil and make it quite friable.

Variegated Thistle.—This is a winter-growing plant, especially prevalent on rich soils and in moist situations. In wet winters it is a serious pest in wheat crops. Though a good fodder plant, viewed strictly from a farmer's standpoint, it must be classed as a bad weed, and every precaution and care should be exercised to rid the cultivation paddocks of it. Good wheat and hay crops have been partially or wholly lost through its encroachment, and at harvest time much trouble is met with owing to the heads choking the combs of the machines. Difficulty in handling hay infested with it also arises. Though an annual and winter plant the seed will germinate at any period of the year when conditions are favourable, which makes it a difficult pest to deal with. Like Bathurst Burr, the seed remains good in the soil for many years.

Cockspur Thistle occupies the same growing period as the preceding plant and is a great nuisance in hay and wheat crops. Stock eat it sparingly in its young stage. It is a hard weed to get rid of, but in ordinary seasons good farming methods tend to keep it under control.

Black Oats.—This winter-growing cereal is the worst pest of our wheat fields. It is especially bad because it grows with the wheat crop and sheds its seed before the wheat is ripe; also because the seed remains viable in the ground for many years. Apart from drought, I believe black oats reduce the wheat yield more than any other cause. During good winters, however, it provides splendid feed for cattle and sheep. It is a very difficult pest to deal with, and at best can only be partially kept under control. Rotation of crops and stocking seem to be the best methods of dealing with it.

Pigeon Grass.—This grows during summer and, although cattle will eat it, it does not appear to be greatly relished by them. It often takes complete possession of cultivation paddocks if they are left out of cultivation, the worst feature being that the soil will not produce good crops immediately following. Among maize it is a hard weed to deal with.

Californian Poppy and Amaranth.—These are two undesirable weeds that need a good deal of attention from the maize-grower.

Zinnia and Convolvulus.—These are two escaped garden flowers, and the latter, in particular, is extremely bad amongst maize. Being a creeper, it climbs around the corn stalks, and if of dense growth will completely destroy the crop.

Calliopsis.—Commonly known amongst farmers as Bull's Head or Cat's Head, this plant is a creeping, yellow-flowered summer weed. Farmers should use every means to prevent it obtaining a hold of cultivation land. To my mind it is absolutely the worst weed to have in orchards or land growing summer crops. It depletes the soil of moisture more quickly than any other weed I know of.

Summer Grass.—This weed flourishes best on red and sandy soils, and during moist seasons is difficult to control.

Prickly Lettuce.—Prickly lettuce has the same growing season as cereal crops, and, if the weather during harvest be showery, it gives much trouble.

The above brief references to the weeds enumerated will suffice for the purpose of this paper. The means farmers must adopt to keep them in check will be suggested by the exigencies of each particular case; but regarding Bathurst Burr and Noogoora Burr, concerted action to check the spread and eventually to eradicate them will be necessary, and as the question is now being taken up by those most concerned, I have no doubt some effective solution of the problem will be evolved.

Discussion.—Speaking to the paper, the Chairman expressed the opinion that Bathurst and Noogoora burrs were the worst weeds, and in the near future would have to be seriously taken in hand. He believed that the seeds of most weeds would remain in the ground for a long time without losing their germinating power.

Mr. Arkinstall said his plan in dealing with black oats was to thoroughly cultivate to get a good germination of the grains. He then let the oats grow till nearly seeding time, when they were fed off clean. The ground was next ploughed shallow, and it would be found the paddock was practically clean. Of course, one missed a season for a wheat crop, but a paddock badly infested remained free for three years after this treatment.

There was a good deal of discussion as to how the black oat got into paddocks, and all members were agreed that it was impossible to keep cultivation paddocks free from the pest.

Kellyville.

A meeting was held on 7th July, with a good attendance of members. After the general business had been disposed of a discussion took place on the necessity for co-operation, and Mr. T. I. Cowley explained the present proposals on the subject, clearly indicating the great advantage of co-operative handling of fruit.

A letter was received from the Brisbane Water and Hawkesbury River Fruit and Vegetable Growers' Association, asking co-operation in their approach to the Minister of Customs on the question of a duty on imported fruits. It was agreed to co-operate.

Leech's Gully.

The annual meeting of this branch was held on 5th June, when the report and balance-sheet disclosed a satisfactory year's operations.

The election of officers resulted thus:—Chairman, Mr. Alfred H. Taylor; Vice-Chairmen, Messrs. A. Sommerlad and J. T. Weir; Treasurer, Mr. P. Sommerlad; Hon. Secretary, Mr. J. Donnelly.

A paper was read by Mr. A. Sommerlad on "What should be the true aim of Agricultural Societies, and wherein they at present fail." He pointed out generally the shortcomings of the societies as at present conducted, contending that the shows consisted too largely of ring events and spectacular exhibits, and advocating in general terms a return to the primary objects.

Lidcombe.

A meeting was held on 4th June, when forty-two members attended. After the general business was concluded a paper was read by Mr. T. King, on vegetable-growing in the home garden. Mr. King dealt exhaustively with every variety of vegetable that is in general use, pointing out the most suitable varieties for the Lidcombe district. A useful discussion followed.

Another meeting was held on 18th June, when Mr. H. Pyne read a paper on spraying, which proved highly instructive and interesting. Considerable discussion took place, many questions being asked and answered by Mr. Pyne, who was accorded a vote of thanks.

A meeting was held on 2nd July, when fifty-one members and friends were present. Mr. E. Cheel, of the Botanic Gardens, gave an interesting lecture on native trees and shrubs. The subject was dealt with exhaustively, eucalypti, acacias, waratahs, and Christmas bush being specially mentioned. Branches of the various trees were exhibited by Mr. Cheel, and the subject thereby made the more interesting and useful.

Lower Portland.

The annual reunion social of this branch was held on 29th June. There were between 150 and 200 people present, and the function was a great success.

Matcham.

A meeting was held on 2nd June, at which fourteen members were present. Mr. A. Macinante read a paper making comparisons between citrus-growing on the Irrigation Area and on the coast. A discussion followed, in which the majority of members expressed themselves optimistically regarding the future of the citrus industry generally.

Mr. W. le Gay Brereton gave a demonstration of pruning at Mr. Cox's orchard on 18th May, under the auspices of this branch; thirty members attended.

A meeting was held on 30th June, at which twenty-one members attended.

Mr. F. W. Clifton, who is acting in an honorary capacity as adviser and lecturer to the branch on veterinary subjects, gave a lecture on first-aid to sick and injured animals, and dealt with the commoner ailments and accidents that stock are liable to.

Mr. J. Anderson read a paper on seasonable vegetable planting.

The books supplied by the Public Library are proving of great interest and instruction to members.

Meadow Flat.

A meeting of this branch was held on 2nd June. Amongst other business was the consideration of a resolution from the Coradgery branch, suggesting a gift of the produce of one acre of wheat of 1917 harvest to the British Government. It was resolved to co-operate.

A meeting was held on 7th July. After the general business was completed a discussion took place on the suggestion of the Brisbane Water and Hawkesbury River Fruit and Vegetable Growers' Association that an import duty should be levied on citrus fruits and apples respectively, and it was eventually decided to co-operate.

Penrose-Kareela.

A meeting was held on 9th June at Mr. G. Johnson's residence, when discussion took place on winter pruning and spraying. On the initiative of Mr. V. S. James, an interesting conversation also took place on the subject of land for returned soldiers.

Spencer.

A meeting was held by this branch on 16th June, when a paper was read by Mr. L Woodbury on the subject of co-operation among fruit-growers. He specially urged that if the success of a co-operative movement required patience and loyalty in a special degree, they should give it.

In the discussion that followed, members agreed that co-operation was necessary to the advancement of the industry.

Springside.

A meeting was held on 6th May, at which twenty-two members were present. The Chairman, Mr. T. Commins, pointed out the objects of the Bureau, and the Secretary read a paper on some of the essential factors in connection with the working of a branch.

A paper was also read by Mr. John Selwood, in which he asked: Are the farmers of this locality getting the best possible returns from their soil?

ARE FARMERS GETTING THE BEST RETURNS?

No doubt in normal seasons the growing of hay and cereal crops in this district is quite satisfactory, but when we take into consideration the amount of labour necessary for the preparation of the seed-bed, harvesting, and delivering to market, and take also the returns, I feel satisfied the margin of profit is not sufficient to justify us continuing to make these our chief crops. Why should we utilise our soil growing produce that can be grown in other districts at less cost, in greater abundance, and on larger areas? The crops which we should cultivate more extensively in this locality are such as cannot be produced profitably, if at all, in hotter and drier parts of the State, and should consist of fruit, root crops, and other vegetables. It has been proved beyond doubt that this locality is particularly suited to this class of cultivation, for all these crops grow to perfection if properly attended to. Taking the average return per acre from these crops, we find them three or four times more profitable than hay or grain crops.

Again, most of the crops mentioned do not drain the soil to the same extent as cereals, and some of them tend to enrich it.

Some farmers have already made a fair start on the lines advocated, but much remains to be done before it can be claimed that the soil and climate are being used to best advantage. At the same time, I would not advocate cutting out hay and grain altogether; a few tons of hay and some bags of grain are useful for our own purposes, and any surplus can be placed on the market. We also find that properties of, say, 70 or 100 acres with an established orchard, if favourably situated, always realise from two to three times more than those not so improved. So that every farmer who plants a few acres of fruit trees is adding to the value of his property.

A meeting was held on 3rd July, at which twenty-three members attended.

It was decided to establish an experimental plot in the locality.

A paper on the soil and the changes effected by fallowing was read by Mr. Jas. Selwood. The following paragraphs are from the paper:—

THE SOIL AND THE CHANGES EFFECTED BY FALLOWING.

The power of the soil to nourish cultivated plants is in proportion to the quantity of nutritive substances which it contains in a state capable of being utilised by plant life. The quantity of other elements present in chemical combination or in a state not available as plant food is also highly important, as they will serve to maintain fertility when the nutritive substances in available condition have been withdrawn from the soil by a crop.

By fallowing we assist Nature in the necessary process of bringing these mineral substances from an unavailable to an available condition. Moisture, a certain degree of heat, and space for the movement of air are necessary conditions for the changes. Water in conjunction with carbonic acid decomposes the silicates, and makes the undissolved phosphates soluble and diffusible through the soil.

The chief aim of the farmer should be to add to the number of particles capable of affording nutrition, and this can be done by a thorough stirring of the soil. We cannot expect the same results from a short summer fallow without other aids as from the longer preparation, because with the latter we are able to give the nutritious particles a wider distribution. Another reason for fallowing is to destroy weeds. The seeds of these mostly ripen about harvest time, and they generally germinate with the sown crop, when we have little chance of dealing with them.

We may continue cropping a field annually by means of a short summer fallow, and get satisfactory crops, so long as the plant food in the soil is in a condition to be utilised by growing plants; but when these available substances are exhausted the crops fail, and we then justly conclude that it is time to fallow that field for a longer period.

We know from experience that some of our lighter soils will not permit of too fine a pulverisation, and therefore we cannot give them the working necessary for a thorough distribution of the nutritious particles. We can undoubtedly help to remedy this defect by ploughing in green crops, the action of which tends to lessen the cohesion and to increase friability beyond that procurable by the most diligent ploughing.

By growing fodder crops and ploughing them under, too, we highly improve the mechanical condition of any soil, and from this point of view, which means much in agriculture, they are to be highly recommended. None of these systems, however, add much to the natural fertility of the soil, which is being gradually lowered by successive cropping, and we must conclude that for any system to last we must do all in our power to maintain as near as possible the natural fertility of the soil.

A short address on other agricultural matters was given by Mr. Coleman, and a general discussion of an informative nature followed.

Tallong.

A meeting was held on 7th July, at which twenty members attended.

After the general business had been disposed of, a discussion took place on railway freights on new and second-hand fruit cases. It was unanimously decided to write to the Minister for Agriculture to see if free carriage could be obtained on empty cases, subject to a guarantee that when full they would be sent an equal distance by rail. The present rate was considered excessive.

The matter of railway freight on artificial manure was also discussed, and it was decided to bring it under the notice of the Minister for Agriculture to see if manures could not be carried at "manure rate, actual weight," instead of a minimum of 8 tons having to be trucked to ensure the cheap rate. Members pointed to the great amount of benefit which would be derived by both farmers and Railway Commissioners if manures were carried free. It would enable farmers to purchase manures, and would result in much better crops. This would be beneficial to the Commissioners, because they would have more tonnage to haul, which would mean freight and revenue.

It was decided to ask neighbouring branches to co-operate with Tallong in these important matters.

The pruning demonstration recently given by Mr. W. le Gay Brereton, Assistant Fruit Expert, was much appreciated.

Thyra-Bunaloo.

A meeting of this branch was held on 2nd June, when a discussion took place on the best method of preventing smut in wheat. The majority of members favoured bluestone, but others stated that they had used certain manufactured articles with satisfactory results. Considerable interest was shown in the experiments of the Agricultural Department with carbonate of copper.

A meeting was also held on 30th June, when members took part in a discussion on mixed farming, the majority being of opinion that sheep-raising and wheat-growing were the most profitable branches of mixed farming for the district.

Toronto.

Meetings of this branch were held on 12th and 26th June, at which there were good attendances of members. Four new members were enrolled at the latter meeting, when a schedule of prizes for the show was discussed, and general business dealt with.

At the meeting held on 10th July one new member was enrolled. The schedule for the show to be held by the branch in October was adopted at the meeting. Several members inquired as to the merits of various sprays, and were afforded information by those who had had practical experience in their use.

Ulan.

A meeting was held on 11th April, at which Mr. R. G. May, Acting Inspector of Agriculture, gave a lecture on wheat culture. Mr. May explained the necessity for and the method of pickling wheat, and gave advice as to the different varieties suitable for the district. A number of questions were answered with profit to members.

Woonona.

A meeting was held on 12th June, which was attended by forty-seven members. A discussion took place on the recent exhibition of poultry, pigeons, agriculture, horticulture, and school children's work, and after a good deal of consideration it was decided to make the exhibition an annual event, but to hold it about the end of January, in order to catch the fruit, vegetable, and flower season.

The Secretary reports that the exhibition was a decided success. In the poultry section eighty-six birds were penned; there were fifty-six entries in the pigeon and canary section; and 325 entries in the different classes of the school section.

The exhibition was undoubtedly a good advertisement for the branch, as the Hon. Secretary has forwarded to the Department the names of twenty-three new members who were attracted by it.

Mr. S. Gahan gave a very interesting and instructive lecture on various matters of interest to the amateur gardener. He dealt with the grafting and pruning of young fruit trees, giving a practical demonstration on about half a dozen young trees in various stages of growth. He also gave a practical exhibition of pruning on a limb of an old tree, pointing out the fruit buds and the wood buds. The planting and care of vegetables in the kitchen garden were mentioned; and altogether the lecture was a valuable one. At the conclusion members freely availed themselves of the opportunity to ask questions, further useful information being the result.

Yarramalong.

A meeting was held on 13th June, when twenty-two members attended.

A pruning demonstration was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, at Mr. G. Hodge's orchard, on 23rd June, the attendance being good, and the demonstration much appreciated.

A meeting was held by the above branch of the Bureau on 30th June, at which twenty-five members attended. A paper was read by Mr. G. Bevan.

DAIRY CATTLE OF NEW SOUTH WALES.

New South Wales carries thousands of head of dairy cattle, principally in the coastal districts, where the farmers have sought to improve productiveness by breeding for milking strains, without depending solely on pedigree. The stock has been mainly founded on the Shorthorn breed, and the most popular cross has been the Ayrshire. Though not pedigree stock, the animals used have been such as can be relied upon to produce milking cattle of the best type. They are big cattle, giving a big milk yield with a fair butterfat test. The cattle are subjected to many changes through frequent spells of dry weather, and this helps to make them hardy and healthy; thus we are affected with very little disease. The principle breeds of the State are Ayrshire, Jersey, Holstein, and Milking Shorthorn, other breeds being Kerry, Dexter, and Guernsey. Mr. Bevan proceeded to give some account of the principal breeds, and to indicate their special utility. His own preference he gave to the Milking Shorthorns, which, though not really a distinctive breed, were yet large animals, with great constitutions, and valuable as dual-purpose cattle.

Orchard Notes.

AUGUST.

W. J. ALLEN.

Spraying.

WINTER spraying with lime-sulphur of all deciduous trees should commence this month. The winter application should be made just as the buds are swelling. This will start with the stone fruits and be followed by the pears and apples. In applying lime-sulphur the nozzle should be held so that only the mist reaches the trees. A better covering of all surfaces will be obtained from the mist spray than from driving spray.

Last season's experiments in the orchard at Yanco Experiment Farm showed this early application of lime-sulphur to be far more effective in controlling Peach Leaf Curl than when the application was delayed till the buds were showing pink, just before blossoming. But until the experiment has been continued long enough to show that this one early spraying is sufficient to control Peach Leaf Curl, it will be wise, where curl is expected to show itself, to follow this early spraying with a second application at a strength of one to 28 (Departmental formula), when the flower buds are just showing pink, but while the petals are still tightly folded.

If aphis are showing on the trees a tobacco wash could be added to the lime-sulphur. Red spraying oil, applied when the trees are quite dormant, has in some instances completely protected peach trees from aphis, but sometimes the treatment is only partially successful, and unfortunately the lime-sulphur will not "take" on the trees after an application of oil. Any trees that have been found to be infested with San José or Mussel Scale should be sprayed with red oil instead of lime-sulphur. We generally find the former more efficient in eradicating these pests.

Where red oil is used for Woolly Aphis on apple trees, spraying should be completed while the trees are still dormant. Here again the oil will prevent the early application of either lime-sulphur or Bordeaux mixture, and the first application of either of these sprays will have to be delayed till the fruit buds are showing pink, but while the petals are still folded tight.

Swabbing Vines.

Black Spot of grape vines was prevalent last season, even in districts where it is very seldom seen. It also attacked varieties of grapes that are generally considered immune. To combat this disease this season, vine-growers should swab their vines with either a solution of sulphate of iron (5 lb. to 1 gallon of water, to which is added half a pint of sulphuric acid), or with one volume of sulphuric acid to ten volumes of water. This dressing is applied to the spurs and new canes with a brush or swab.

Brown Spot of Mandarin.

The diseased and dead wood showing in the trees should be cut out and burned. The first application of Bordeaux mixture should be applied before the spring blossoming, either at the end of this month or early in September. Where this disease has been bad and no treatment has hitherto been given, Bordeaux mixture, 6–4–50, should be used, but where the disease has been greatly reduced by the previous season's treatment the Bordeaux mixture could probably be reduced to 6–4–100, or half normal summer strength.

Pruning and Ploughing.

Pruning of the late blossoming pears and apples can be continued, but an effort should be made to finish up the work as early as possible this month.

Ploughing should also be completed early this month.

Manuring of Citrus Trees.

Those who intend using quick-acting fertilisers should make the first application this month. It is better not to apply too much at one time, but rather to make two applications—one now and one after the fruit has set. Spread the fertiliser well through the rows; the outer fringe of foliage is usually a good guide as to where to commence sowing the manure. In the drier districts where late rains are uncertain, it is better to make the application early rather than late, as it is well known they will not give good results if applied when the soil is at all dry.

Regular light annual dressings of from 3 to 5 cwt. per acre should be the rule of the orchardist. In light poor soils where trees are in full bearing, at least 10 cwt. per acre should be applied.

Planting.

It is late for planting many varieties of stone fruits now, but apples and pears can still be planted in the colder districts, though earlier planting is to be preferred where possible, especially where the spring is a dry one.

Citrus trees can be planted during the latter part of this month in the milder coast districts. In frosty situations, however, planting should be delayed till danger of late frosts is over. Care should be taken that the roots are not exposed to either wind or sun during planting, nor should they be allowed to suffer subsequently from any lack of moisture. Cut the trees well back when planting, and mulch the surface with well rotted straw or stable manure.

Grafting, &c.

Nursery stock can be grafted during the latter part of this month. Any older trees that it is desired to work over to more suitable varieties can be grafted as soon as the sap is running and the bark lifts freely.

Harvesting.

The marketing of citrus fruits from our late districts will continue. Care should be taken not to allow Emperor Mandarins to hang too long, or they will become puffy.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society	Secretary.	Date
Trundle P. and A. Association	W. E. Herborn	Aug. 7, 8
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 21, 22, 23
Parkes P., A., and H Association	G. N. Seaborn	,, 22, 23
Corowa P., A., and H. Society	J. D. Fraser	,, 28, 29
Grenfell P., A., and H. Association	G. Cousins	,, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 4, 5
Albury and Border P., A , and H. Society	W. J. Johnson	,, 4, 5, 6
Manildra P. and A. Association	A. Anderson	Abandoned.
Gilgandra P. and A. Association	G. Christie	Sept. 5, 6
Ganmain A. and P. Association	T. S. Henderson	,, 11, 12
Young P. and A. Association	T. A. Tester	,, 11, 12, 1
Lockhart A. and P. Society	E. D. Arnold	,, 12, 13
Cowra P., A., and H. Association	E. W. Warren	,, 18, 19
Narrandera P. and A. Association	H. S. Robinson	,, 18, 19
Temora P., A , H., and I. Association	A. D. Ness	,, 18, 19, 20
Holbrook P., A., and H. Society	J. S. Stewart	,, 19, 20
Boorowa P., A., and H. Association	W. Burns	,, 20, 21
Wyalong District P , A., H., and I. Association	T. A. Smith	,, 25, 26
Canowindra P., A., and H. Association	G. Newman	,, 25, 26
Murrumburrah P., A., and I. Association	J. A. Foley	,, 25, 26
Henty P. and A. Society	H. L. Yates	,, 25, 26, 27
Yass P. and A. Association	E A. Hickey	,, 26, 27
Newcastle A., H., and I. Association (Spring Show)	E. J. Dann	,, 28, 29
Junee P., A., and I. Association	T. C. Humphreys	Oct. 2, 3
Ardlethan P. and A. Society	W. J. Nixon	,, 3
Deniliquin P. and A. Society	L. Harrison	,, 3
Hay P. and A. Association	G. S. Camden	,, 9, 10
Millthorpe A. and P. Association	C. J. E. Hawken	,, 10
Carcoar H. C. and A. Association	J. L. Howarth	,, 24
Tweed River A. Society	T. M. Kennedy	Nov. 7, 8

1918.

Albion Park A., H., and I. Association	J. Caldwell	Feb. 6, 7
Dapto A. and H. Society	J. J. Cook	,, 20, 21
Alstonville A. Society	C. D. McIntyre	,, 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 26, 27, 28
Moruya A. and P. Society	H. P. Jeffery	,, 27, 28
Newcastle A., H., and I. Association	E. J. Dann	,, 27, 28; March 1, 2
Tenterfield P , A., and M. Society	R. G. White	Mar. 5 6, 7
Tumut A. and P. Association	T. E. Wilkinson	,, 6, 7
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne	,, 6, 7, 8
Glen Innes & Central New England P. & A. Assocn.	G. A. Priest	,, 12, 13, 14
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	,, 13, 14
Camden A., H., and I. Society	A. E. Baldock	,, 13, 14, 15
Cooma P. and A. Association	C. J. Walmsley	,, 20, 21
Gundagai P. and A. Society	C. D. Asprey	,, 20, 21
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,, 20. 21, 22
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	April 10-13

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Agricultural Gazette of New South Wales.

Sudan Grass.

ITS BEHAVIOUR IN VARIOUS EXPERIMENTS.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

A COMPREHENSIVE series of experiments with Sudan grass was carried out during the past season at Hawkesbury Agricultural College, Grafton Experiment Farm, and Yanco Experiment Farm, in order—(1) to ascertain its value compared with millets as a summer catch crop for coastal districts and for the Murrumbidgee Irrigation Area; (2) to test it as a pasture grass during the summer months; and (3) to ascertain its comparative productivity under dressings with various fertilisers. In addition, areas were sown at Nyngan, Cowra, and Wagga Experiment Farms, to ascertain its behaviour under dry summer conditions, and to determine the optimum rates of seeding.

Experience at Hawkesbury Agricultural College.

Mr. W. D. Kerle, Experimentalist, Hawkesbury Agricultural College, reports as follows:—

This experiment was conducted on poor pipe-clay soil with a retentive subsoil. It was intended to sow in November, but heavy rains caused the soil to set firmly, and sowing could not be done until 18th December.

The plots were arranged thus:—

5 Chains.

2 Chains.	(1) Hungarian Millet	6 rows
	(2) Manchurian Millet	6 rows
	(3) Sudan Grass	18 rows
	(4) Japanese Millet	6 rows
	(5) Hungarian Millet	6 rows

Drills 3 feet apart were opened 4 inches deep with the drill plough, and the sowing was made with a maize dropper at the rate of 8 lb. of seed per acre. The germination of all plots was excellent, and owing to favourable conditions subsequent growth was rapid. When harvested the Japanese millet was 3½ feet high, the Hungarian 4¾ feet, the Manchurian 4½ feet, and the Sudan grass 7½ feet. Considerable variation was noticed in the Sudan grass plot, particularly with regard to tall and dwarf plants; these must vary considerably in productiveness and feeding value, and marked improvement should result from selection and separation of the superior forage types. Cultivation between the rows was carried out on 9th January and 20th February, 1917. The blocks were cut for greenstuff when in ear and weighed.

Japanese millet, being much the earliest, was harvested on 19th February, Manchurian millet and Sudan grass on 1st March, and Hungarian millet on 8th March. The Sudan grass was cut and tied with the maize harvester, which did excellent work.

The weather following the first cut was very dry and hot, and only Sudan grass gave a second cut on 20th April.

Sudan Grass, Hawkesbury Agricultural College.

The complete harvest results are as follows:—

Variety.	Plot Yield. 1st Cut.				Plot Yield. 2nd Cut.			Total Yield, per acre.			
	t.	c	q.	lb.	c.	q.	lb.	t.	c.	q.	lb.
1. Hungarian	0	16	0	24	Nil.			5	18	3	17
2. Japanese	0	9	2	0	Nil.			3	9	2	18
3. Sudan grass ...	0	10	2	4	7	0	14	6	10	0	15
4. Manchurian ...	0	15	1	14	Nil.			5	12	3	0
5. Hungarian	0	16	1	7	Nil.			5	19	2	14

Twelve rows of Sudan grass were left for seed, and yielded on 27th April 170 lb. of good clean plump seed. This would represent a yield per acre of 623½ lb.

The rainfall was distributed as follows:—

	Inches.
Japanese millet, from seeding to harvest... ...	5·77
Manchurian millet, from seeding to harvest ...	6·855
Hungarian millet, from seeding to harvest ...	7·01
Sudan grass (1st cut)	6·855
„ „ (2nd cut)	1·25

Very dry and hot conditions obtained after the first cut of Sudan grass, which makes the yield of 7 cwt. 0 qr. 14 lb. (equivalent to 2 tons 12 cwt. 1 qr. per acre, on a rainfall of 1¼ inches) all the more creditable.

The results of the trial from this point of view are in favour of Sudan grass. As a catch crop it is superior to the millet, and in a favourable season, when sown early, should give three or four cuttings. Although, perhaps, Manchurian or Hungarian may outweigh Sudan grass in the first cut, it is in the after growth, both in abundance and palatability, that Sudan grass is particularly superior.

Sudan Grass (second growth) in the foreground, and Japanese Millet (first cut) in the background, Yanco Experiment Farm.

Experience at Yanco Experiment Farm.

Mr. J. M. Pitt, Experimentalist, Yanco Experiment Farm, reports as follows:—

Previous experience demonstrated that with this grass rapid growth does not take place here until warm weather sets in; the sowings, therefore, were delayed until towards the end of October. The plots were arranged as follows:—

No. 1.	No. 2.	No. 3.	No. 4.
Japanese Millet. Sown in drills 3 feet apart. 6 lb. seed per acre.	Sudan Grass. In drills 3 feet apart. 6 lb. seed per acre.	Japanese Millet. Broadcast. 16 lb. per acre.	Sudan Grass. Broadcast. 16 lb. per acre.

Superphosphate, at the rate of 50 lb. per acre, was previously applied with the drill to all plots.

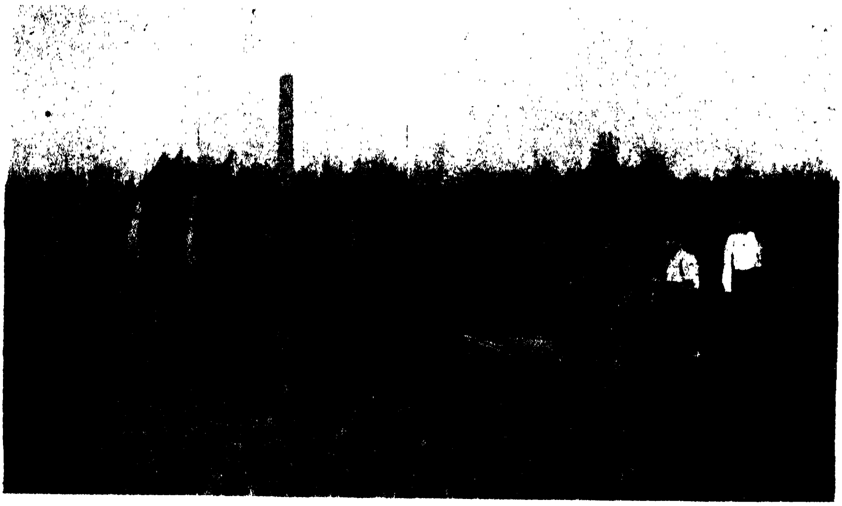
Germination in all cases was good. Sudan grass proved to be the quicker grower, reaching a height of 4½ feet, whilst the Japanese millet grew to 1 foot 6 inches. The latter, however, stooled better, and Sudan grass evidently requires cutting or checking in its earlier growth to give this result.

In the drilled plots, the plants withstood short dry spells better than the thick stands of the broadcasted sections, and maintained a darker green foliage throughout. Sudan, in this respect, stood out to advantage, the thick succulent stems of the Japanese millet requiring more moisture than its rival.

After ten weeks' growth both plots of the Sudan grass had matured sufficiently to cut, and they were harvested with the reaper and binder. It took a further three weeks for the Japanese millet to reach the cutting stage, but the yield in both plots was heavier than the Sudan ; the broadcasted section in particular was very fine, reaching nearly 5 feet in height, and yielding at the rate of over 6½ tons per acre.

Cows depastured on Sudan Grass and Japanese Millet, Yanco Experiment Farm.

During the three weeks intervening between these first cuttings of Sudan grass and of Japanese millet, the second growth of the former had made good headway, the young plants stooling well and attaining a height of nearly 3 feet. This second growth was cut on the 4th March, 1917, *i.e.*, seven weeks after the first cutting ; it had then reached 6 feet in the drilled plot and 5 feet in the broadcast. After this a third growth took place, reaching about 1½ feet high, but it was eaten off by dairy stock. Since then the plots have been grazed several times, the stand still being green on the 27th April.



Harvesting Sudan Grass at the Hawkesbury Agricultural College.

Hungarian Millet, Hawkesbury Agricultural College.

SUDAN GRASS.

The Japanese millet in its second growth only reached about 6 inches when it went to seed. The crop was too short to cut, so cattle were allowed to graze it off. It was found advisable to irrigate twice, viz., on 17th January and 15th February. The following table shows the comparative yields:—

Plot I. Japanese Millet. Drilled.					Plot II. Sudan Grass. Drilled.					Plot III. Japanese Millet. Broadcast.					Plot IV. Sudan Grass. Broadcast.				
Plot yield.	Acre yield.				Plot yield.	Acre yield.				Plot yield.	Acre yield.				Plot yield.	Acre yield.			
lb.	t.	c.	q.	lb.	lb.	t.	c.	q.	lb	lb.	t.	c.	q.	lb.	lb.	t.	c.	q.	lb
2,418	2	7	0	11	968	0	18	3	12	6,844	6	13	1	8	1,656	1	12	1	1
					3,286	3	4	0	1						2,749	2	13	2	5
Total yields per acre	2	7	0	11	...	4	2	3	13	...	6	13	1	8	...	4	5	3	6

[It will be observed that the yield from the first cut of Sudan grass was remarkably low, and out of all proportion to that from the second cut. This was undoubtedly due to the abnormally cold wet conditions which prevailed during November and early December, conditions which were to the advantage of the Japanese millet, but to the disadvantage of the Sudan grass. Had the conditions been normal it is quite probable that the Sudan grass would have outyielded the millet. In any case, a close perusal of the Experimentalist's observations shows that the aftergrowth of the Sudan grass is out of all proportion to that of the millet.—E.B.]

Experience at Grafton Experiment Farm.

Mr. K. McPherson, Experimentalist at Grafton Experiment Farm, reports as follows:—

The sowing was made with acclimatised seed at the rate of 10 lb. per acre on the 2nd October, 1916, in moderately moist soil, by means of the Planet Jr. implement, and in drills 3 feet apart. Fairly dry conditions followed for upwards of a fortnight, but the seed germinated satisfactorily in from seven to ten days. Some plants were considerably more backward than others, but after 76 points of rain they quickly made up for lost time and the crop soon presented a uniform appearance. The millets germinated splendidly, with the exception of Japanese, which failed absolutely, probably owing to faulty seed.

Good falls of rain have been recorded throughout the season, November with nearly 10 inches being excessive. Once the Sudan grass became firmly established, profuse stooling and prolific dark green growth have been outstanding features of a promising crop at all times. The stems were mostly thick, sweet and juicy, but perhaps a little coarse in the later stages of growth. Little or no rust has appeared up to the time of writing (15th April). It is shooting out vigorously again after being cut for the fourth time in 6½ months. Fifteen to twenty stalks to a stool were common, and in many cases a height of 8 to 9 feet was attained. The grass is a perennial here, although it does not make much headway after the first year. The Manchurian millet also stooled well, while the Hungarian millet had the characteristic tall, slender appearance.

It will be seen from the accompanying table that the first cutting of Sudan grass was obtained on the 15th December, almost ten weeks from the date of sowing; but once the stools expanded and established themselves, cuttings were obtained at intervals of from seven to eight weeks, the heaviest yield of greenstuff from any one cutting being 3¾ tons, and the average well over 3 tons. As nearly as possible the harvesting operations were carried out when the crop was in full flower; the plot was cut and weighed immediately for greenstuff, then left to cure in the ordinary way, and the hay weights ascertained.

The grass made much more rapid headway than either of the millets. Taking the first two cuttings of each, the increase of the Sudan grass over Manchurian millet was close on 1 ton, and over the Hungarian millet it was 2 tons. The total of the three cuttings of Sudan grass almost equalled the combined weights of the four cuttings from the two varieties of millet, there being approximately a difference of only 5 cwt. The results are presented in the table:—

Variety.	Germination.	Date cut.	Rainfall.*	Yield per acre.							
				Greenstuff.				Hay.			
	per cent.	1916.	inches.	t.	c.	q.	lb.	t.	c.	q.	lb.
Sudan grass ...	90	15 Dec.	14·54	2	17	1	7	....			
		1917.									
		8 Feb.	8·54	3	15	0	20	1	17	3	11
		10 April.	10·06	3	10	3	4	....			
Manchurian millet.	90	8 Jan.	16·30	2	12	0	0	....			
		28 Feb.	7·99	3	3	0	14	1	13	1	9
Hungarian millet ...	85	5 Jan.	16·27	1	18	3	20	....			
		28 Feb.	8 02	2	14	3	6	1	0	3	25

* The first rainfall in each case is from sowing till first cutting; thereafter it is from cutting to cutting.

The three crops were sown on 2nd October, 1916.

Trials on the South Coast.

The Inspector of Agriculture on the South Coast, Mr. R. N. Makin, reports thus:—

During the summer 1916–17, there were under observation on the South Coast three plots of Sudan grass. The season was apparently too wet for a plant which has the reputation of being valuable for green fodder purposes under drier conditions.

The plot sown on Mr. J. Miller's farm, opposite the Toolijooa railway platform, was seeded on 20th December, 1916, and made rapid growth in comparison with five varieties of sorghum sown in the same paddock at the same time. The crop attained a height throughout of about 7 feet, and survived a heavy windstorm better than was expected. A little over three months from sowing it was cut and fed out to dairy stock, and judging by the manner in which it was consumed it was very palatable. The second growth made by the plants was very poor.

The plot sown on Mr. J. Timbs' farm at Albion Park was sown earlier, and had to contend against an excessive growth of weeds that germinated with it. In parts, where it overcame the weeds, a height of 6 or 7 feet was attained. Only a poor second growth was made.

Good growth was made at Milton, and Mr. Buchan, on whose farm the plot was sown, informs me "that the plot was very successful. It was sown on 19th December, 1916, and cut on 5th March, 1917, having at that time attained a height of 7½ feet, and being fairly even. The second growth was poor, reaching a height of about 15 inches. Had an earlier sowing been made the second growth would no doubt have been better; at the present time—8th June—cattle are grazing on the plot, the crowns of the plants being still green. All classes of stock were very fond of the feed."

Farmers' Experiment Plot of Sudan Grass at Albion Park, South Coast.

These tests were of much interest to farmers. The sowings were unavoidably late, and the season wet. With earlier sowings and under average weather conditions, Sudan grass should prove of some value to dairy farmers for green fodder and for hay.

Some Additional Reports.

The following additional reports have also been received :—

The Manager, Wagga Experiment Farm, writes :—One quarter of an acre was sown on the 21st October. Germination was excellent and growth rapid.

We were able to cut show sheaves of this grass 4 feet 6 inches long in January. It is a promising grass for this district, so far as the growth in the past season was concerned. The season, however, was an abnormal one. The grass is of coarse texture, and in normal seasons this feature would be still more apparent.

The Manager, Coonamble Experiment Farm, who tried this grass, writes:—I am very doubtful whether the growth of summer crops of any kind is possible with reasonable hopes of success on the heavy (black) soil of this farm. Had the Sudan grass (and Planter's Friend) been grown on good, retentive loamy soil, I think that with the weather conditions this year the crop would have been very good, whereas on the black soil it was a comparative failure. This is due to the rapid drying and cracking which occurs in this class of land.

The Manager, Nyngan Demonstration Farm, writes:—On the 3rd October, 1916, one acre was planted with Sudan grass seed, one-half at the rate of 3 lb. per acre, and the other half at 4 lb. per acre. The rainfall during growth was abundant, and on the 16th January, 1917, the whole area was harvested by cutting with the binder, and was subsequently threshed with a flail, yielding 100 lb. of seed. The second growth made fair headway for a time, but dry conditions set in towards the end of February, and the growth was not equal to the first cutting. On the 30th March, the two plots were cut for hay, and yielded as follows:—

The portion sown at 3 lb. per acre produced a total of 358 lb. of hay, and that at 4 lb. per acre yielded 377 lb. of hay.

At Cowra Experiment Farm, from an area of about 2 acres, 580 lb. of seed were harvested.

Feeding-off Trials at Yanco Experiment Farm.

An experiment to test Sudan grass as a pasture grass was carried out at Yanco Experiment Farm. The Experimentalist reports as follows:—

To make the experiment more interesting and valuable, and at the same time to give the cows a greater variety of fodder, a plot of mixed feed millets (Hungarian, Chinese, Yellow and White Manchurian) and a plot of Teff grass (*Eragrostis abyssinica*) were included. The area cropped, approximately 4 acres, was divided into two equal sections of five plots each, a period of five weeks elapsing between the sowings of each section; these were made on 24th October and 1st December, 1916.

The arrangement of the plots is shown in the accompanying plan:—

Section 1.					Section 2.				
Varieties of Millet.	Sudan grass.	Teff grass.	Sudan grass.	Japanese millet.	Varieties of Millet.	Sudan grass.	Teff grass.	Sudan grass.	Japanese millet.

Both the Japanese millet and the Sudan grass were sown through the wheat drill, every alternate opening being blocked; the rows were thus about 1 foot apart. About 10 lb. of seed were sown per acre. The millet varieties and the Teff grass were broadcasted, 20 lb. of the former and 16 lb. of the latter to the acre. Each section was treated with superphosphate at the rate of 60 lb. per acre.

Germination in all cases was good, with the exception of the Teff grass, which came up rather unevenly. Sudan grass and the majority of the millets made exceptionally quick growth. In the section sown last, the warm weather was very much to the liking of Sudan grass, and the growth was particularly rapid. Of the millets, Chinese showed up to advantage, followed by Hungarian. The Japanese was slower, but made matters more even by stooling better. The Teff grass was slow.

Grazing Notes.—Twenty-one cows, Jerseys and Ayrshires, were used for the trial, being turned on only in the daytime. Feeding-off commenced on 12th January on Section 1. The Sudan grass was then 5 feet high, the Japanese and other millets 1 foot 6 inches, and the Teff grass 1 foot high. All were in a suitable stage for grazing, except Sudan, which had matured some ten days or more before the others. During the six days the cows were allowed to graze, it was observed that Japanese millet was receiving most attention, being the most attractive on account of the abundance of soft green succulent foliage. It was closely followed in favour by the Sudan grass and the other millets, but Teff grass was almost totally neglected. At the end of this period any stalks remaining were mown off and the section was irrigated. Grazing on this section took place again from 8th to 11th February inclusive. The Sudan grass had then stooled well and made excellent growth, and being in a more suitable condition was soon eaten off. The Japanese millet, on the other hand, made very little second growth, soon running to seed; nevertheless it was all eaten. The millet varieties made little growth, while the Teff grass made a moderate stooling, grew to about 1 foot, and was again neglected by the cows. After this the Sudan grass alone continued to make good growth, the millets dying off, and the Teff grass making little headway. The section was grazed again from 26th to 28th February, and also at various periods to the time of writing (May).

On the second section, grazing took place from 2nd to 7th February inclusive, from 2nd to 6th March, and at various intervals following. Much the same results were obtained as with the previous section, Sudan and then Japanese millet being the most sought after. Teff, although in an excellent stage for grazing, was again neglected, and when driven on to the plot the cows soon left it, and returned to the Sudan or Japanese millet plots.

Summarising the results, it may be stated that Japanese millet produced a great quantity of fodder for the first growth, and was appreciated by cows even when past maturity, in which respect it is superior to Sudan grass. The second growth is inferior, however, the plants running to seed very quickly, whilst there was practically no third growth. The Sudan grass is a rapid grower, maturing fully two weeks earlier than the others. During the hot months it grows rapidly, and responds more quickly than any to the application of water. It is not affected by short spells of hot, dry weather. Cows prefer it young, although the bulk is eaten when well past maturity. It is advisable to eat off or cut the first growth early, so as to encourage stooling, which it does heavily, yielding a large quantity of fodder. Growth continues well into the winter months. Owing to the manner in which it stands grazing, the quantity of fodder produced, the lengthy season for which it is available, its suitability for hay, and its annual character (which allows of easy eradication if necessary), it should be preferable to Paspalum. The other millet varieties are not to be compared with the Japanese. They are poor stoolers and fail to stand grazing.

Teff grass was a disappointment. It grows fairly rapidly and stools fairly well, but withers with the first spell of dry or hot weather, probably owing to its shallow rooting. Cows eat it only in a very young stage, and not at all when it is mature.

Trials with Fertilisers at Tallawang.

A very interesting and valuable experiment in the above direction was initiated and carried out by Mr. S. E. Hinder, of Tallawang Public School, who supervised the boys in doing the field work. Mr. Hinder reports as follows:—

Some notable results in the trial of this fodder plant by the pupils have just been achieved. The grass was sown in October last in the experimental plots, the first cut being made on the 26th December, and the second on the 18th February. A third cut will, on present appearances, be made about the first week in April. The plots were conducted partly as manurial trials, and it is in this connection that the interest is greatest. The manures used were—(1) Superphosphate, and (2) a mixture containing 13 per cent. phosphoric acid and 4 per cent. nitrogen. The weights of fodder cut per acre, worked out on the second cut, with the manurial cost based on last season's rates, were as follows:—

Kind and Quantity of Manure.	Cost of Manure.		Weight per acre dried.			
	s.	d.	t.	c.	q.	lb.
Unmanured	Nil.		1	12	0	0
Superphosphate, 25 lb.	0	10¼	2	11	1	20
,, 50 ,, ...	1	8½	3	0	0	0
,, 75 ,, ...	2	6¾	2	8	2	8
,, 100 ,, ...	3	5½	3	5	2	24
Mixed Fertiliser, 50 ,, ...	2	1	4	8	2	8

The first cut yielded at about the same rate, though unfortunately no actual weighing was made. Assuming, and the assumption is not an exaggerated one, that the third cut yields in the case of the mixed fertiliser 2 tons to the acre, the magnificent result of over 10 tons to the acre will have been achieved.

Horses and stock have taken to the grass with avidity, and appear to relish it as much as wheaten hay. If it can be proved that horses will work as well on the Sudan chaff as they do on wheaten, on this score alone the grass should prove a magnificent acquisition. The Department of Agriculture states that one of the principal characteristics of the grass is its wonderful drought-resisting powers. Observations carried out here would seem to show that the plant stools better and is finer in the stalk after the first cut. For that reason it might be advisable to give a paddock a quick cropping by sheep when it is about 6 inches high. This would probably delay the first cut a week or so, but on the experience obtained here this would be an advantage, as being ready nearer the end or even after the conclusion of wheat stripping.

General Review.

The reports in the foregoing pages will stand close perusal. There appears no doubt whatever that Sudan grass is a distinct acquisition to our fodder plants, both on the coast and in the interior. It is superior to the millets, in that the growth after the first cutting is much more abundant, and it can also be depastured well into the winter. In the interior, it is doubtful if better results can be achieved from any other cultivated grass, and the observation of the Experimentalist at Yanco Experiment Farm, that he considers it superior to Paspalum, is worthy of record. The very complete results from the pasturing experiments at Yanco places its palatability beyond all question. It is also noteworthy, as shown by the Tallawang results, that this grass responds admirably to fertilisers.

It will also be noticed on perusal of the reports, that Sudan grass is best handled by cutting early, in order to encourage stooling and to prevent coarseness. It seems advisable to cut the first crop for hay as soon as the first flowers begin to peep. Subsequent cuttings can be made similarly, or the grass depastured as desired.

A very large amount of seed of this grass has been distributed by the Department to private applicants, and much has also been sown in Farmers' Experiment Plots, and the reports to hand in every case are very promising.

COMPARATIVE VALUES OF FOODS FOR PIGS.

ACCORDING to some experiments conducted by Professor Nils Hansson, of the Stockholm Experiment Station, the following are the comparative values of some foods for pigs. In the first four cases the equivalent values have been substantially confirmed in Ireland by experiments carried out at the Department of Agriculture's Experiment Stations and by the itinerant Instructors. Barley was used as the basis :—

Barley...	1·0
Maize ...	0·95
Potatoes	4·0
Separated milk (·1 per cent. fat)	6·0
Buttermilk (·6 per cent. fat)	6·0
Whey (·2 per cent. fat)	12·0
Mangels and turnips...	8–10

In other words, to replace 1 lb. barley, 4 lb. potatoes or 8 lb. to 10 lb. of mangels or turnips would have to be used.

Notes on the Stud Wheat Plots, 1916.

J. T. PRIDHAM, Plant Breeder.

THE past season was an abnormal one, and the results afford little guidance to the farmer in making choice of varieties to sow, inasmuch as similar climatic conditions may not occur again for some time. Consideration of the wheats being tested in the Plant Breeder's plots at the six Government Experiment Farms included in the table at the end of this article will give an idea of the varieties which are in general suited to each locality. Besides the kinds listed, a number of crossbreds were included in the second sowing at Cowra. At this Farm the wheats were divided into two classes—"main crop" and "early maturing" varieties, the former being sown nearly a month before the latter.

In order to save time in the handling of the large number of plots that were sown at Cowra and Nyngan, the dry sheaf weight was taken as representing the yield; but at the other farms the returns were made up on the basis of actual yields of grain. The methods of planting have not been identical at the different farms, the number of plots and checks varying with the area of land available, the number of varieties to be tested, and the assistance procurable. At the Cowra, Wagga, Bathurst, and Nyngan farms, and also in part at Hawkesbury Agricultural College, every alternate plot was sown with a check variety, thus giving as uniform conditions as possible to every variety tested. At Glen Innes a check occurred at every third plot. Single seeds were dropped at every 5 or 6 inches in the row, each single row constituting a plot at a distance of 2 links apart. The plots were 30 links long, and about 45 grains were sown in each. The germination in all the plots was sufficiently even to afford comparisons, except in the case of Genoa at Glen Innes.

The continuous rains in the winter and spring caused the soil to go out of condition and become waterlogged. The plants did not make a strong, healthy growth, and in consequence they suffered from rust and other fungus diseases. We may look at the results at each Farm in detail.

At Cowra the best yielders were Currawa, Bomen, Canberra, Hurst's No. 8, and Marshall's No. 3. Currawa has somewhat weak spongy straw, like Bunyip, but stands up well enough to be harvested. Bomen has tough straw, but in some seasons suffers from frosting. Canberra and Hurst's No. 8 have weak straw and are certain to lodge unless sown comparatively late. Roseworthy is very like Marshall's No. 3, and will be further tested. Hard Federation is a consistent yielder, and a satisfactory all-round wheat at this Farm.

At Nyngan the best wheats were Nyngan No. 2 (same pedigree as Clarendon), Nyngan No. 1, Gluyas Early, and Florence. The yields were particularly good at this Farm, the wet season suiting such dry country, where the most that can be expected in an average year is a moderate hay crop or a light grain crop. Firbank, Sunset, Steinwedel, and Hurst's No. 4 usually give a good account of themselves at this Farm. Nyngan No. 1 contains Bobs and Gluyas Early in its pedigree in common with Clarendon.

At Wagga the early ripening wheats, Clarendon, Nyngan No. 3, and Hurst's No. 3, yielded best. Federation and Marshall's No. 3 would give better returns here in most seasons than the above varieties. Canberra and Hurst's Nos. 2–11 are selections from what we believe to be a hybrid between Federation wheat and naked barley. The original types saved all resembled wheat, but the straw was uniformly weak and mostly tall. The grain quality was similar, being excellent in colour, with a good flour yield. The flours behaved similarly in the chemist's hands, though the water absorption and gluten content were higher in some strains than in others. They are all quick growing varieties. Canberra has done well at every farm where it has been tried, provided it is sown late. On the Coast, however, it takes rust easily. The crossbred Hudson's Early Purple Straw x Gluyas Early is very productive, but its straw is inclined to be weak.

At Bathurst the variety Cleveland has yielded consistently for many years, and is undoubtedly specially suited to the local conditions as a main-crop wheat. Canberra, Cleveland, Sutton's Sensation, and Cleveland Crossbred 117 yielded best. Sutton's Sensation is a red grain variety, ripening a trifle later than Cleveland, imported from Messrs. Sutton, of Reading, England. It is suited only to the cooler districts, and does not yield particularly well here in an average year. Dart's Imperial is a good deal favoured by farmers in the district, but its performances in our plots do not justify us in recommending it.

At Glen Innes the early-ripening wheats often give the best crop, in spite of the coldness of the climate and the long growing season. Florence and Clarendon (both early-maturing wheats) yielded best. Genoa is a reliable cropper here, but in fumigating for weevil we must have inadvertently damaged the seed for the plots. It is difficult otherwise to account for the poor germination and consequent low yields. The Early Haynes' Blue-stem crossbred is a promising hay wheat. The seed has not been raised in quantity yet.

The returns were particularly disappointing at Hawkesbury Agricultural College. At the end of October, on inspecting the plots, it was noted that Clarendon and Warren looked remarkably well, but the heavy rains soon afterwards altered the whole aspect of affairs, and the final yields are not at all comparable. Warren and Cleveland usually thrive best, with Clarendon in a drier year. When sowing one might begin with Cleveland, following on with Warren, and completing the season's sowing with Clarendon. The value of Huguenot lies mainly in its use as green fodder and silage.

SUMMARY of Results of Stud Wheat Plots, 1916.

Variety.	* Cowra.			* Nyngan.			Wagga.			Bathurst.			Glen Innes.			Hawkesbury College.		
	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.
			lb. oz.			lb. oz.			lb. oz.			lb. oz.			lb. oz.			lb. oz.
Bobs	...	...	...	...	...	...	...	...	...	3	8–10 May	1 14	...	...	...	...	...	...
Bomen	24	4 May	2 11	...	...	...	4	29 May	1 0	...	...	...	...	...	...	...	...	...
Bunge No. 1	...	...	...	...	...	...	4	..	0 13	...	...	...	...	...	...	...	...	...
Bunyip	6	1 June	1 6	...	...	...	4	,,	0 11	...	...	...	...	...	...	...	...	...
Canberra	6	,,	2 7	12	May ...	2 4	4	..	1 2	3	8–10 May	4 5	3	7 June	2 5	...	...	...
Clarendon	6	,,	1 11	...	...	...	4	..	1 7	...	...	...	3	,,	3 1	9	16 May	0 5
Cleveland	...	...	...	...	...	...	...	...	...	63	8–10 May	3 15	...	...	...	...	...	...
College Purple	...	...	...	...	...	...	...	...	...	3	,,	2 9	...	...	...	...	...	...
Commonwealth	24	4 May	1 13	...	...	...	4	29 May	0 3	3	,,	2 8	...	...	...	...	...	...
Cowra No. 3	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	1 14	...	...	...
Cowra No. 15	24	4 May	1 12	...	...	...	4	29 May	0 9	3	8–10 May	3 0	3	,,	1 11	...	...	...
Cowra No. 19	24	,,	2 0	...	...	...	4	,,	1 1	...	...	...	...	...	...	...	...	...
Currawa	24	,,	2 12	...	...	...	4	,	0 15	3	8–10 May	2 15	...	...	...	...	...	...
Dart's Imperial	...	...	...	...	...	...	...	...	...	3	,,	2 13	...	...	...	...	...	...
Federation	24	4 May	1 14	...	...	...	4	29 May	0 11	3	,,	2 10	...	...	...	...	...	...
Firbank	...	...	...	11	May ...	2 3	4	,,	1 0	...	...	...	...	...	...	...	...	...
Florence	...	...	...	12	,, ...	2 5	...	...	...	...	...	...	3	7 June	3 1	...	...	...
Genoa	...	...	...	...	...	...	...	...	...	...	...	...	22	,,	0 7	...	...	...
Glen Innes White ...	...	...	...	...	...	...	...	...	...	3	8–10 May	2 0	3	,,	1 2	...	...	...
Gluyas Early	6	1 June	1 12	12	May ...	2 9	...	...	...	...	...	...	...	...	...	...	...	...
Hard Federation	230	4 May	2 3	345	,, ...	2 0	125	29 May	0 15	...	...	...	...	...	...	...	...	...
Harriet	6	1 June	1 5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Haynes' Bluestem ...	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	1 0	...	...	...
Huguenot	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	16 May	0 8
Hurst's No. 2	...	...	...	...	...	...	4	29 May	0 11	...	...	...	...	...	...	...	...	...
Hurst's No. 3	6	1 June	2 1	...	...	...	4	..	1 3	...	...	...	...	...	...	...	...	...
Hurst's No. 4	6	,,	1 10	12	May ..	2 4	4	..	0 14	...	...	...	...	...	...	...	...	...
Hurst's No. 5	...	...	...	...	...	...	4	..	1 0	...	...	...	...	...	...	...	...	...
Hurst's No. 7	...	...	...	...	...	...	4	..	0 14	...	...	...	...	...	...	...	...	...
Hurst's No. 8	6	1 June	2 7	...	...	...	4	,,	1 0	...	...	...	...	...	...	...	...	...
Hurst's No. 9	6	,,	1 12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hurst's No. 11	6	,,	1 7	12	May ...	2 4	...	...	...	...	...	...	...	...	...	...	...	...
Jonathan	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	1 10	...	...	...
Major	...	...	...	...	...	...	4	29 May	0 9	3	8–10 May	1 14	...	...	...	...	...	...
Marshall's No. 3	24	4 May	2 5	...	...	...	4	..	0 12	3	,,	2 11	...	...	...	...	...	...
Moira	...	...	...	...	...	...	4	..	0 12	...	...	...	...	...	...	...	...	...

* The yields at Cowra and Nyngan represent straw and grain; at the other farms grain only.

SUMMARY of Results of Stud Wheat Plots, 1916—*continued.*

Variety.	* Cowra.			* Nyngan.			Wagga.			Bathurst.			Glen Innes.			Hawkesbury College.		
	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.	No. Plots.	Date Sown.	Average Yield.
			lb. oz.			lb. oz.			lb. oz.			lb. oz.			lb. oz.			lb. oz.
Nardoo	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	1 7	...	...	...
Nyngan No. 1	...	...	...	12	May ...	2 10	...	...	...	...	...	...	...	...	...	...	...	...
Nyngan No. 2	6	1 June	1 10	12	,, ...	2 15	...	...	...	...	...	...	...	...	...	...	...	...
Nyngan No. 3	6	,,	1 7	11	,, ...	2 2	4	29 May	1 5	...	...	...	...	...	...	...	...	...
Pioneer	...	...	...	11	,, ...	1 10	...	...	...	...	...	...	...	...	...	...	...	...
Power's Fife	...	...	...	...	...	...	...	...	...	3	8–10 May	2 6	...	...	...	...	...	...
Roseworthy	24	4 May	2 4	...	...	...	4	29 May	0 14	3	,,	3 7	...	...	...	...	...	...
Rymer	...	...	...	...	...	...	4	,,	0 8	3	,,	3 9	...	...	...	...	...	...
343 South Australian ...	...	...	...	11	May ...	1 8	...	...	...	...	...	...	...	...	...	...	...	...
Steinwedel	...	...	...	12	,, ...	2 1	...	...	...	...	...	...	...	...	...	...	...	...
Sunset	...	...	...	12	,, ...	1 9	...	...	...	...	...	...	...	...	...	...	...	...
Sutton's Sensation ...	...	...	...	...	...	...	...	...	...	3	8–10 May	3 10	...	...	...	...	...	...
Thew	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	2 14	...	...	...
Wagga No. 13	...	...	...	...	...	...	4	29 May	0 14	...	...	...	...	...	...	...	...	...
Wagga No. 22	6	1 June	1 4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wagga No. 31	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	1 15	...	...	...
Walmer	...	...	...	12	May ...	2 1	...	...	...	...	...	...	...	...	...	...	...	...
Warden	...	...	...	...	...	...	4	29 May	1 2	...	...	...	...	...	...	...	...	...
Warren	24	4 May	2 1	...	...	...	4	,,	0 14	...	...	...	3	7 June	2 6	...	...	...
White Federation ...	6	1 June	1 7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Yandilla King	24	4 May	2 7	...	...	...	4	29 May	0 12	3	8–10 May	3 2	...	...	...	...	...	...
Zealand	...	...	...	...	...	...	4	,,	0 12	...	...	...	...	...	...	...	...	...
Early Haynes' Bluestem Crossbred	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	1 1	...	...	...
(Federation x Gluyas) ...	...	...	...	...	...	...	4	29 May	1 0	...	...	...	...	...	...	...	...	...
(Federation x Yandilla King)	...	...	...	...	...	...	4	,,	1 1	...	...	...	...	...	...	...	...	...
(Hudson's Purple Straw x Gluyas)	...	...	...	...	...	...	4	,,	1 3	...	...	...	...	...	...	...	...	...
(Florence x Huguenot) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	16 May	0 5
(MBSa x Jonathan x Warren)	...	...	...	...	...	...	...	...	...	...	...	...	3	7 June	1 3	...	...	...
(Warren x Florence x Huguenot)... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	16 May	0 5
Cleveland Crossbred 102...	...	...	...	...	...	...	...	...	...	3	8–10 May	2 15	...	...	...	...	...	...
Cleveland Crossbred 112...	...	...	...	...	...	...	...	...	...	3	,,	2 12	...	...	...	...	...	...
Cleveland Crossbred 113...	...	...	...	...	...	...	...	...	...	3	,,	2 5	...	...	...	...	...	...
Cleveland Crossbred 117...	...	...	...	...	...	...	...	...	...	3	,,	3 10	...	...	...	...	...	...

* The yields of Cowra and Nyngan represent straw and grain; at the other farms grain only.

Conclusions.

The variety which seemed to stand above the others last season is Clarendon. Although omitted from the Bathurst and Nyngan plots, we may take the wheat Nyngan No. 2, which topped the yields at the latter farm, as practically identical with Clarendon. This was remarked in referring to the Nyngan plots. Clarendon is a (Bobs x Gluyas Early x Fife-Indian) crossbred, previously known as Hawkesbury No. 3. Its chief defect is weakness of straw, though it is not inferior in this respect to Thew, which it much resembles. The ear, however, has short awns at the tip which are not present in Thew. Federation gave poor returns throughout, but we have no wheat superior to this for a main crop in favourable years in the chief wheat-growing districts.

ANALYSIS OF MACROZAMIA OR BURRAWANG NUTS.

A CORRESPONDENT recently asked for an analysis of Macrozamia or Burrawang nuts, and in reply the Chemist to the Department stated that according to an analysis he had made a few years ago the Burrawang nut contains:—

Water	48·42	per cent.
Fat	0·69	,,
Albuminoids	11·54	,,
Starch	28·37	,,
Sugar	3·78	,,
Cellulose	6·54	,,
Ash	0·66	,,
	100·00	

Starch made from the above contained:—

Starch Granules	82·47	per cent.
Water	16·42	,,

It was pointed out that the nut is poisonous, and was said to produce "rickets." The poison is volatile, and the nuts or starch are quite harmless if heated or roasted. The poison is stated to be oxalic acid, but as this has not been satisfactorily proved the matter will be further investigated. An extensive reference to this subject will be found in the *Agricultural Gazette*, volume IV (1893), page 158.

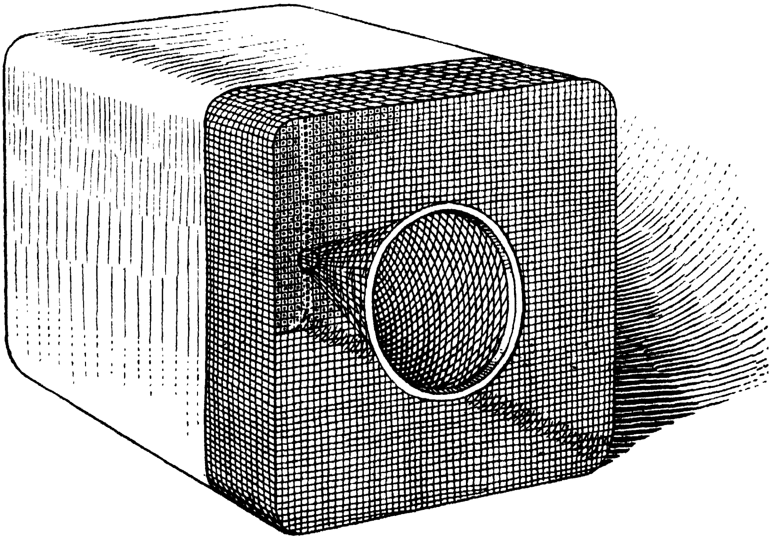
A Simple Type of Blow-fly Trap.

JOHN L. FROGGATT, B.Sc., Officer-in-Charge, Government
Sheep-fly Experiment Station.

THE question of destroying sheep-maggot flies by trapping them before they have time to deposit their eggs upon the sheep has been advocated by the Department of Agriculture for some time, and a number of sheep-owners have been trapping flies in various ways, with very marked results.

A number of different traps have been advertised, and placed on the market by dealers, some at a price almost prohibitive where large numbers are required. The writer has been experimenting for some time with a view to producing a simple trap, at a very low cost, that can be set and looked after by any station hand.

The illustration shows one that can be made on any homestead by a handy man with an empty petrol or kerosene tin, and some wire gauze.



How to Make the Trap.

The end is removed from a kerosene tin and the open space covered with galvanised wire gauze which overlaps the sides of the tin about 2 inches, and around which it is bent. Let into the wire gauze covering is a funnel 4 inches across at the top and 5 inches in length, the opening at the apex (*i.e.*, into the tin) being about the size of a threepenny piece. The inside of the tin is painted white with cold-water paint; if the outside is also painted the life of the trap will be prolonged considerably.

This type of trap has been tested at the Government Sheep-fly Experiment Station, and has also been used by many pastoralists in various parts of the State, with excellent results.

For a bait any offal (although the heart, liver and lungs are the best) putrid meat, dead rabbits where obtainable, or milk which has been left to go sour and then putrefy, can be used with very satisfactory results.

Notes on the Wheats competing at the Royal Agricultural Society's Show.

EASTER, 1917.

F. B. GUTHRIE.

As was anticipated, the number of entries for the wheat competition was considerably in excess of last year, or of any preceding year, 109 individual exhibits being staged. This was due to the fact that competitors in the Growing-crop Competition, instituted by the Society and carried out during 1916, were asked to enter a bag of wheat for competition at the Easter Show.

While the entries were numerically greater, it cannot be said that the quality was up to the standard of previous years. This, of course, was only to be expected from the lower quality of the f.a.q. wheat, which was only 56¾ lb. for the 1916-17 harvest (the lowest yet struck for New South Wales), as against 62½ lb. for last year. The falling-off in quality is especially remarkable in the "Soft White" class, as will be seen from the accompanying table giving the weights per bushel, gluten content, and flour strength for the past thirteen years. The bushel-weight for the Soft White has undoubtedly maintained itself, and is indeed higher than it has ever been, but gluten and flour-strength have receded badly.

It must be said that bushel-weight, when applied to Show-wheats, is not a very safe guide as to quality, for the reason that these wheats are specially cleaned and prepared for Show purposes. This is sufficient to account for the remarkable discrepancy between the 56¾ lb. f.a.q. and the 67½ lb. which is the average for the soft-white Show wheats. It is simply a matter of cleaning and selecting.

The inherent qualities of the grain (gluten content and flour strength) are, however, not affected by such manipulation, and it is here that the superiority of the Strong Flour wheats is apparent, since in such an adverse season as we have experienced they have held their own well (as far as quality is concerned), the flour-strength being actually higher than in any previous year.

The judges were Messrs. R. W. Harris (Gillespie Bros.) and G. W. Norris (Chemist's Branch, Department of Agriculture); the milling of the samples being carried out by Mr. Norris.

The following are notes supplied by the judges:—

"The wheat exhibit is the largest staged for some years, but unfortunately, from a commercial point of view, the excessively wet weather at harvest time spoilt the appearance of the grain in many cases. The bleaching has undoubtedly affected the quality of the grain this year, this being most noticeable in the case of the weak-flour wheats, such as Federation and Petatz Surprise. In many instances, too, signs of germination are evident, particularly in the Soft White class.

" Another very serious defect in the samples is the presence of weevil, and if the exhibits afford a fair example of the destruction done by the weevil, then the loss to the State in this direction must be colossal. From the damage done one would be justified in concluding that they were old wheats, as in some cases only the shell of the berry is left.

"The special classes (for Yandilla King and for Federation) are well represented, there being eight entries in each. The class for the best bag of wheat not included in the list of varieties recommended by the Department, is also well filled, among the exhibits being some of the best of the American varieties, such as Marquis, as well as Mr. J. B. Roach's renowned Indian wheats.

"In connection with the special prize for Federation, the ordinary Federation clashes with the Improved Hard Federation, and, under the existing method of judging, the latter must always take first place.

" In the class of wheats not included in the Government list the Pusa wheats (Indian) were run very closely by Prelude, while last year the winner in this class (Pusa No. 4) took first prize in the Hard Strong White class, beating Comeback. If placed on a similar footing this year, Comeback would have upheld its reputation. When we consider that at this Show some of the world's best wheats are exhibited, it is then that the late Mr. W. Farrer's work comes so much more into prominence, and it is to be deplored that the farmer is not sufficiently highly paid to encourage the cultivation of these high-quality wheats."

TABLE showing average bushel-weights, gluten-content, and water-absorbing power of wheats of the "Strong White" and "Soft White" classes milled at the Royal Agricultural Society's Show, from 1905–1917.

Year.	Weight per bushel.		Gluten.		Flour Strength. (Water-absorption, quarts per 200 lb. sack.)	
	Strong White.	Soft White.	Strong White.	Soft White.	Strong White.	Soft White.
	lb.	lb.	per cent.	per cent.	per cent.	per cent.
1905	63	64	10·0	9·7	46·6	45·2
1906	63¾	64½	11·0	9·8	48·5	45·7
1907	62½	66	9·3	8·3	48·4	45·4
1908	64½	65	12·2	10·2	52·5	46·4
1909	64¾	65¼	11·9	8·6	53·5	49·2
1910	64½	64	13·8	12·1	50·0	47·8
1911	64½	63½	12·5	11·0	53·4	47·0
1912	65	64	13·4	10·6	52·7	45·2
1913	67	65¼	15·2	11·7	53·1	46·9
1914	67¾	67	12·8	10·6	52·3	45·0
1915	67½	66½	13·1	12·4	53·8	45·7
1916	67¼	67¼	13·0	12·3	53·3	47·5
1917	66	67½	12·4	8·6	54·6	43·0

WEIGHTS PER BUSHEL.

Catalogue No.	Variety.	Bushel-weight. lb.	Catalogue No.	Variety.	Bushel-weight. lb.
	Class 880 (Macaroni Wheat).				
5699	Indian Runner	67·1	5702	Huguenot	65·7
5700	Medeah	66·6	5703	Kubanka	65·5
5701	Huguenot	63·1			
	Class 881 (Hard Red).				
5704	Cedar	67·4	5708	Cedar	65·3
5705	,, ...	64·1	5709	,, ...	66·1
5706	,, ...	65·5	5711	,, ...	68·6
	Class 882 (Strong White).				
5712	Comeback	65·3	5715	Comeback	65·8
5713	,, ...	64·7	5716	,, ...	67·8
5714	,, ...	65·5	5717	,, ...	66·6
	Class 883 (Medium Strong).				
5718	Zealand	63·6	5733	Firbank	64·5
5721	Florence	63·1	5734	Yandilla King	64·1
5722	Yandilla King	64·2	5735	Federation	59·4
5723	Rymer	64·4	5736	Bunyip	65·5
5724	Bomen	64·2	5737	,, ...	66·3
5725	Firbank	64·7	5738	Florence	67·0
5726	Yandilla King	64·0	5739	,, ...	66·0
5727	Bomen	65·2	5741	Federation	58·0
5728	Firbank	65·0	5742	Firbank	62·5
5729	,, ...	65·7	5743	Florence	65·7
5730	Florence	61·8	5744	,, ...	67·6
5731	Firbank	65·3	5745	Firbank	65·3
	Class 884 (Special Prize for Yandilla King).				
5747	Yandilla King	66·0	5750	Yandilla King	63·0
5748	,, ,, ...	63·6	5751	,, ,, ...	65·7
5749	,, ,, ...	64·4	5752	,, ,, ...	64·6
	Class 885 (Special Prize for Federation).				
5754	Federation	63·3	5758	Federation	62·3
5755	,, ...	64·9	5759	,, ...	57·8
5756	,, ...	66·0	5760	,, ...	66·3
5757	,, ...	59·6	5761	,, ...	63·7
	Class 886 (Weak Flour).				
5762	Petatz Surprise	68·1	5766	Petatz Surprise	66·3
5763	,, ,, ...	67·3	5767	,, ,, ...	68·2
5764	Steinwedel	65·7	5768	Warren	67·6
5765	,, ...	62·6			
	Class 887 (Varieties not in Government List).				
5769	Smut-proof	65·7	5775	Smith's No. 1	60·2
5770	Marquis	65 7	5776	Marquis	63·9
5771	Huron	65·5	5777	Pusa No. 4	67·3
5772	Prelude	66·3	5778	,, 107	67·6
5773	Currawa	60·5	5779	Currawa	66·5
5774	College Purple Straw ...	65 7	5780	,, ...	65 0

RESULTS OF MILLING TESTS.

	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	10	15	10	10	15	20	20	100
Catalogue No.								
Class 881 (Strong Red).								
5709	10	*[66·1]* 13	8	*[71·2]* 9	13	*[13·2]* 16	*[54·8]* 19	88
5711	9	*[68·6]* 15	8	*[71·6]* 9	11	*[11·3]* 14	*[54·6]* 19	85
Class 882 (Australian Strong White).								
5716	10	*[67·8]* 15	8	*[73·7]* 10	15	*[12·4]* 15	*[55·0]* 19	92
5715	9	*[65·8]* 13	8	*[73·7]* 10	13	*[13·5]* 16	*[54·0]* 19	88
5717	8	*[66·6]* 14	8	*[70·7]* 8	14	*[11·3]* 14	*[54 8]* 19	85
Class 883 (Medium Strong Flour).								
5744	10	*[67·6]* 14	10	*[71·6]* 8	15	*[13·5]* 16	*[47·0]* 14	87
5737	9	*[66·3]* 13	10	*[72 8]* 9	15	*[12·9]* 16	*[47·0]* 14	86
5739	8	*[66·0]* 13	10	*[75·0]* 10	14	*[13·3]* 16	*[46·0]* 14	85
5738	10	*[67·0]* 14	10	*[73·5]* 9	15	*[12·1]* 15	*[42·2]* 12	85
Class 884 (Special Yandilla King).								
5749	7	*[64·4]* 12	10	*[72·6]* 9	12	*[9·3]* 12	*[42·4]* 12	74
5751	8	*[65·7]* 13	10	*[71·4]* 9	10	*[8 0]* 11	*[42·4]* 12	73
Class 835 (Special Federation).								
5755	7	*[65·0]* 13	10	*[72·8]* 10	15	*[12·2]* 15	*[48·6]* 15	80
5760	9	*[66·3]* 13	10	*[74·3]* 10	10	*[8·2]* 12	*[42·0]* 11	75
5756	8	*[66.0]* 13	10	*[71·1]* 9	10	*[8·5]* 12	*[42·4]* 11	73
5761	9	*[63·7]* 12	10	*[72·7]* 10	12	*[6·3]* 9	*[40·2]* 9	71
Class 886 (Weak Flour).								
5768	10	*[67·6]* 15	10	*[73·7]* 10	12	*[9·7]* 13	*[45·0]* 13	83
5767	10	*[68·2]* 15	10	*[72·0]* 9	10	*[8·9]* 12	*[43·0]* 11	77
5762	10	*[68·1]* 15	10	*[71·4]* 9	8	*[7·2]* 10	*[42·0]* 11	73
Class 887 (Varieties not in Government List).								
5778	10	*[67·6]* 14	8	*[72·8]* 10	12	*[10·8]* 14	*[50·0]* 16	84
5777	10	*[67·3]* 14	8	*[71·8]* 9	14	*[11·8]* 15	*[45·4]* 13	83
5772	9	*[66·3]* 13	8	*[71·0]* 8	15	*[12·4]* 15	*[47·0]* 14	82

RESULTS OF EXAMINATION OF THE WHEATS IN CLASSES WHICH WERE NOT SUBJECTED TO THE MILLING TEST.

Catalogue No.	Variety.	Weight per bushel.	Appearance of Grain.	Trueness to Type.	Uniformity.	Total.
	Maximum Marks.	15	10	10	10	45
	Class 880 (Macaroni Wheat).					
5702	Huguenot	*[65·7]* 13	10	10	10	43
5699	Indian Runner ...	*[67·0]* 14	8	9	8	39
5700	Medeah	*[66·6]* 14	7	8	7	36
5703	Kubanka	*[65·5]* 13	5	5	10	33
5701	Huguenot	*[63·1]* 12	5	8	6	31
	Class 888 (Collection of Five Farrer Wheats).					
5782	Comeback	*[65·5]* 13	8	8	9	38
	Rymer	*[66·5]* 14	8	9	8	39
	Cedar	*[65·8]* 13	8	8	8	37
	Florence	*[63·1]* 12	6	6	7	31
	Jade	*[63·7]* 12	6	8	6	32
						177
5783	Cedar	*[65·0]* 13	8	9	9	39
	Florence	*[66·0]* 13	8	8	7	36
	Comeback	*[65·4]* 13	8	9	9	39
	Bunyip	*[65·4]* 13	10	10	9	42
	Bomen	*[64·6]* 12	8	9	8	37
						193
5784	Bobs	*[64·4]* 12	10	10	10	42
	Comeback	*[65·8]* 13	9	10	10	42
	Cedar	*[65·7]* 13	10	10	10	43
	Jonathan	*[65·3]* 13	8	9	10	40
	Florence	*[65·1]* 13	9	9	8	39
						206

RESULTS OF EXAMINATION OF WHEATS—*continued.*

Catalogue No.	Variety.	Weight per bushel.	Appearance of Grain.	Trueness to Type.	Uniformity.	Total.
	Maximum Marks.	15	10	10	10	45
	Class 888 (Collection of Five Farrer Wheats)—*continued.*					
5785	Cedar	*[65·7]* 13	8	8	9	38
	Comeback	*[66·0]* 13	9	8	9	39
	Bobs	*[66·0]* 13	10	10	10	43
	Florence	*[64·5]* 12	10	9	9	40
	Schneider	*[64·7]* 12	10	9	9	40
						200
5786	Cedar	*[67·7]* 15	10	10	10	45
	Comeback	*[67·6]* 14	10	10	10	44
	Florence	*[66·3]* 13	10	10	10	43
	Warren	*[66·6]* 14	10	10	10	44
	Jade	*[66·6]* 14	10	10	10	44
						220
	Class 889 (Collection of Five Non-Farrer Wheats).					
5788	Pusa No. 4... ...	*[67·0]* 14	10	10	10	44
	„ 107... ...	*[67·1]* 14	10	10	10	44
	„ 110	*[67·3]* 14	10	10	10	44
	Petatz Surprise ...	*[67·3]* 14	10	10	10	44
	Purple Straw ...	*[66·5]* 14	10	10	10	44
						220
5787	Yandilla King ...	*[66·5]* 14	8	9	8	39
	Petatz Surprise ...	*[66·5]* 14	8	9	8	39
	Marquis	*[66·5]* 14	8	10	10	41
	Huron	*[64·2]* 12	8	10	8	38
	Prelude	*[63·7]* 11	7	10	9	37
						194

Awards.

Class 880— Macaroni.	First Prize, No. 5702—S. Pollock; Huguenot; grown at Quirindi, on red soil; seed per acre, 45 lb.; yield per acre, 22 bushels; rainfall during growth, 14·22 inches; autumn ploughing. Second Prize, No. 5699—W. Clark; Indian Runner; grown at Angle Vale, South Australia, on sandy soil; seed per acre, 1¼ bushels; yield per acre, 25 bushels; no record of rainfall; fallow.
Class 881— Strong Red.	First Prize, No. 5709—S. Pollock; Cedar; grown at Quirindi, on black soil: seed per acre, 45 lb.; yield per acre, 16 bushels; rainfall during growth, 13·57 inches; autumn ploughing. Second Prize, No. 5711—W. H. Scholz; Cedar; grown at Gilgandra, on red loam; seed per acre, 30 lb.; yield per acre, 24 bushels; rainfall during growth, 15 inches; autumn ploughing.
Class 882— Strong White.	First Prize, No. 5716—W. H. Scholz; Comeback; grown at Gilgandra, on red loam; seed per acre, 30 lb.; yield per acre, 22 bushels; rainfall during growth, 15 inches; autumn ploughing. Second Prize, No. 5715—S. Pollock; Comeback; grown at Quirindi, on black soil; seed per acre, 45 lb.; yield per acre, 22 bushels; rainfall during growth, 13·57 inches; autumn ploughing.
Class 883— Medium Strong.	First Prize, No 5744—W. H. Scholz; Florence; grown at Gilgandra, on red loam; seed per acre, 30 lb.; yield per acre, 21 bushels; rainfall during the growth, 15 inches; autumn ploughing. Second Prize, No. 5737—N. Neilsen; Bunyip; grown at Wyalong, on light sandy loam, clay subsoil; seed per acre, 36 lb.; yield per acre, 15 bushels; rainfall during growth, about 7 inches; fallow. This wheat also secured Champion Prize for best bag of wheat exhibited, and First prize for bag of wheat exhibited, and First Prize for bag of wheat, any variety, at Wyalong Show, 1916.
Class 884— Special for Yandilla King.	No. 5749—D. and J. Gagie; grown at West Wyalong, on light loam; seed per acre, 45 lb.; yield per acre, 26 bushels; rainfall during growth, 12·6 inches; fallow.
Class 885— Special for Federation.	No. 5755—D. and J. Gagie; grown at West Wyalong, on light loam; seed per acre, 45 lb.; yield per acre, 18 bushels; rainfall during growth, 11·4 inches; fallow.
Class 886— Weak Flour.	First Prize, No. 5768—W. H. Scholz; Warren; grown at Gilgandra, on red loam; seed per acre, 30 lb.; yield per acre, 26 bushels; rainfall during the growth, 15 inches; autumn ploughing. Second Prize, No 5767—J. B. Roach; Petatz Surprise; grown at Gilgandra, on red sandy loam; seed per care, 45 lb.; yield per acre, 18 bushels; autumn ploughing.
Class 887— Varieties not in Government list.	No. 5778—J. B. Roach; Pusa, No. 107; grown at Gilgandra, on sandy loam; seed per acre, 60 lb.; yield per acre, 24 bushels; autumn ploughing.

The judging was carried out as in previous years. The bushel-weights of all the samples were taken, and the results are given in the first of the tables which follow. After careful inspection to eliminate the inferior exhibits, those which were considered eligible for prizes were milled in the small model mill of the Department of Agriculture, and the prizes finally awarded in accordance with their actual behaviour in the mill, marks being assigned to the different milling characteristics. The results of these tests are given in the table headed "Results of Milling Tests," in which the figures within brackets are the actual figures obtained, the others being the marks assigned.

In judging the classes for macaroni wheat, for collection of five Farrer wheats, and for collection of five non-Farrer wheats, the entries in which classes are not subjected to the milling test, a slight innovation was introduced in the method of judging. Hitherto the collections were judged by appearance only. This year a scale of points has been made, giving marks to bushel-weight, appearance, trueness to type, and uniformity, thus putting the judging of such collections on a more satisfactory basis.

BEARING OF CLIMATIC CONDITIONS ON THE SPRAYING PROBLEM.

ORCHARDISTS in various parts of the State may have noticed that some of the sprays recommended by the Department, even when applied at the strengths suggested, have resulted in injury to the foliage. There would, therefore, appear some justification for condemning the recommendation. But the more the spraying problem is studied the more evident it becomes that climatic conditions have a distinct influence either on the spray used or on the foliage. Considering the area covered by the State, it is therefore obvious that every orchardist must become his own experimenter to some extent, and must carefully note the effect of the spray upon a few trees before treating his whole area.

An interesting sidelight on this problem is shed by the writers of "Bulletin No. 120," of the United States Department of Agriculture—"Apple Powdery Mildew and its Control in the Pajaro Valley." It would seem that this particular valley presented unique features with regard to the effect of the commonly-used sprays. The authors, Messrs. W. S. Ballard, Pathologist, Fruit-disease Investigations, and W. H. Volck, County Horticultural Commissioner of Santa Cruz County, California, state that it is probable that a cool foggy climate with its lesser amount of sunshine is the factor which produces apple foliage that has a lower resistance to injurious spray materials and a higher susceptibility to disease than that grown in districts where more intense sunshine and higher temperatures obtain. Also the presence of fog and dew moisture on the foliage tends to dissolve and decompose some spray materials after they have been applied. This susceptibility of the foliage to spray injury had been especially noticeable in the case of arsenicals, and both Paris green and the ordinary type of arsenate of lead caused severe foliage injury. Even Bordeaux mixture and lime-sulphur solution of a strength commonly employed with success elsewhere proved too injurious, and several years of investigations and observations convinced the writers that the trees of that district were in a particularly sensitive physiologic condition.

These facts are very suggestive, and should convince orchardists of the necessity for careful experiment where the use of sprays at the strength recommended by the Department has not been successful. Not only should these tests be carried out, but the results would well form the basis of a discussion at the meetings of the local branch of the Agricultural Bureau, in order that, arising out of the experience of several fruitgrowers, a standard of strength for the district could be arrived at.

Varieties of Maize in New South Wales.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE recognition of different varieties of maize is a matter of some importance to the farmers of this State, and the lack of accurate descriptions of the best varieties has perhaps been increasingly felt during the last few years, during which more attention has been directed to this crop.

The description of a variety of maize in any detail presents greater difficulties than that of wheat or other self-fertilised plants. Maize differs from these other cereals in being essentially cross-fertilised, and much greater latitude must be allowed in a varietal description of maize because of the many different types of which a variety is composed. It is not sufficient to take a typical ear and to make an accurate description of it do for the variety, for this would not necessarily cover the range which might be allowed in the selection of ears for seed, even when the variety in question is very uniform in character. Neither can the description be made to cover every ear which might be harvested from a crop of the variety, for in any selected seed ear only the characters of the female parent are in evidence, and the resultant crop contains also the characters of the several male parents.

By allowing some latitude and considering only what should be selected for seed as the general type of the variety, it is possible to give a description of the different varieties that is sufficient for general recognition. The characters which chiefly define varieties of maize are differences in maturing period and growth, average size of ear, size of grain (particularly breadth and length), colour of grain, and general character of dent.

When a variety yields about 75 per cent. of its crop conforming to a general description of the ears planted, it may be called very pure. The complete elimination of impure or undesirable types is an impossibility with the maize crop, but it is possible to get considerable uniformity in a variety by continuous selection to a definite type.

The varieties which are recommended by the Department for different parts of the State are described in the following notes. Other local varieties or recently introduced varieties of merit will be treated at a later date.

Leaming.

This is one of the oldest-named varieties in existence. Its history shows that it originated in Ohio, U.S.A., in 1826. It was evolved from the existing corn of the day, purely by selection in the field, for a particular type of stalk and ear. Though some of the characters for which the variety was originally selected are not so prominent in the variety as we have it in this State to-day, it has become well acclimatised to our conditions, and is now one of the most popular varieties in New South Wales. It was originally selected in America by Mr. J. S. Leaming, of Clinton County, Ohio, for a stalk of medium height with a large number of broad leaves, the stalk thick at the base and tapering rapidly up to the tassel. The ear was not too high on the stalk, and was supported by a long thick shank which allowed the ear to hang downward at maturity. Mr. Leaming endeavoured to select all his ears, if possible, from stalks which bore two ears, believing that this indicated ability to succeed under adverse conditions. He also chose tapering ears because he thought that this character indicated early maturity.

Leaming at Grafton Experiment Farm, 1916–17.
Note the characteristic slender stalk above the ear.

The variety was introduced into this State many years ago, and at once obtained the designation "Early Leaming," on account of its earliness compared with the varieties usually grown on the North Coast. It quickly adapted itself to the climatic conditions there, and in so doing lengthened its growing period until now it takes about five months to mature in that district. It was, therefore, decided by the Department to officially drop the prefix "Early," owing to the confusion caused in districts, such as the

Tablelands, where early varieties are required, and where farmers may be—indeed, have been—misled by the name into purchasing it as a sort that is suitable to their requirements, whereas under cool conditions it sometimes fails to mature before frost. However, it is still early in maturing compared with some of the varieties grown on the North Coast which take about six and a half or seven months to mature.

Leaming has proved itself to be well suited to the North Coast for early sowing, but although it will easily mature when planted in midsummer, it seldom does well when planted so late.

The stalk is fine compared with the later coarse-growing varieties, and on fertile soil it stools rather abundantly, expecially if planted thinly. These characters have made the variety also popular for early fodder on the coast and in some of the Tableland districts. The stalk grows to 8 or 10 feet high under North Coast conditions, and the ear is placed from 4 to 5½ feet from the ground. The shank supporting the ear is fairly stout and long, and nearly all the ears droop alongside the stalk at maturity. The husk covers the ear fairly well, but more improvement can still be effected in this character.

The standard size of ear weighs from 10 to 13 oz., is 8 to 9 inches in length, and 6½ to 7½ inches in circumference. Most of the ears are somewhat tapering, and the dent is smooth to slightly rough, but never pinched. The rows vary in number from eighteen to twenty-four, and curving of the rows to the right or left is not uncommon. The dropping of rows is also frequent, mostly taking place in the upper third of the ear. The rows are generally irregular at the tip. The tips of the ears are usually well filled, and the butts fairly well rounded. The shank is medium to large for the size of the ear. The space between the rows is medium to small, and the grains very tight on the cob. The grain is thick in proportion to its breadth, with rounded sides, which give it an oval—almost round—shaped crown. It is about $\frac{6}{16}$ inch broad and $\frac{8}{16}$ to $\frac{9}{16}$ inch deep. The colour of the grain is dark amber with a small bright yellow cap. The smaller size of the grain and the sharp distinction in colour between the grain and the small cap readily distinguish this variety from any other. The germ is large, and the grains number about 1,300 or 1,400 to the lb. The ears shell about 84 or 85 per cent. of grain, and it is one of the best varieties known in this respect.

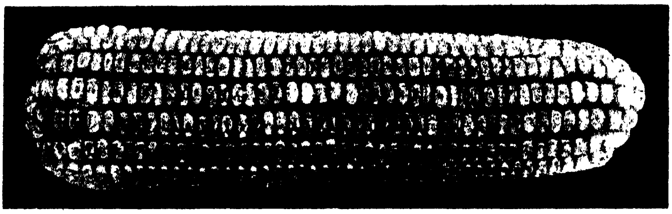
Throughout the variety in recent years there has developed a red colour in the grain of many ears, but this has not altered the other characters. In some cases the red colour has been strongly developed to make a different variety called "Red Leaming," but this does not differ greatly in the main characters from the ordinary Leaming. In selection for type at Grafton Experiment Farm, the red colour is not being distinctly encouraged; but with the dark amber colour of the grain a slight or medium red colour is scarcely discernible in a bulk sample.

The small size of the grain creates some demand for this variety as poultry feed, it being considered by some to be unnecessary to crack it for this purpose.

At Sherwood, Macleay River, in 1916, a plot of this variety went 101 bushels per acre; and at Coramba (North Coast) in 1913 a yield of 88 bushels per acre was obtained without manure. At Tumbarumba, on the Southern Slopes, a yield of 18 tons of green fodder per acre was produced in 1912.

Improved Yellow Dent.

The origin of this variety is somewhat obscure. It seems to have been originally introduced from America about twenty years ago, and was distributed amongst farmers on the Clarence River. Mr. A. H. Haywood, formerly manager of the Grafton Experiment Farm and now manager at Wollongbar Experiment Farm, states that when he assumed the management of Grafton farm in 1905, he obtained locally some seed of this variety, and it did so well the first year it was tried that he grew it ever afterwards, improving it each year by selection. The variety has probably become greatly changed since its first introduction, at least in maturity. There does not seem to be any American variety which is similar to it now. It was named Improved Yellow Dent by Mr. Haywood.



Improved Yellow Dent.

This variety has been extremely popular on the North Coast for many years, and its culture has considerably extended, even to the South Coast, during the last few years. It not only does well on rich soils, but is also popular on soils of moderate fertility, such as old cultivated land which is not abundantly supplied with humus. It has given its best results on nearly all parts of the North Coast with a November sowing, but it may also be sown in December with good results, and it is sometimes sown as early as August or September in that district. On the South Coast it must be sown in October to mature before the cold weather sets in. On all parts of the coast it is the most popular variety for green fodder or silage, on account of its large yields and fine succulent stalks.

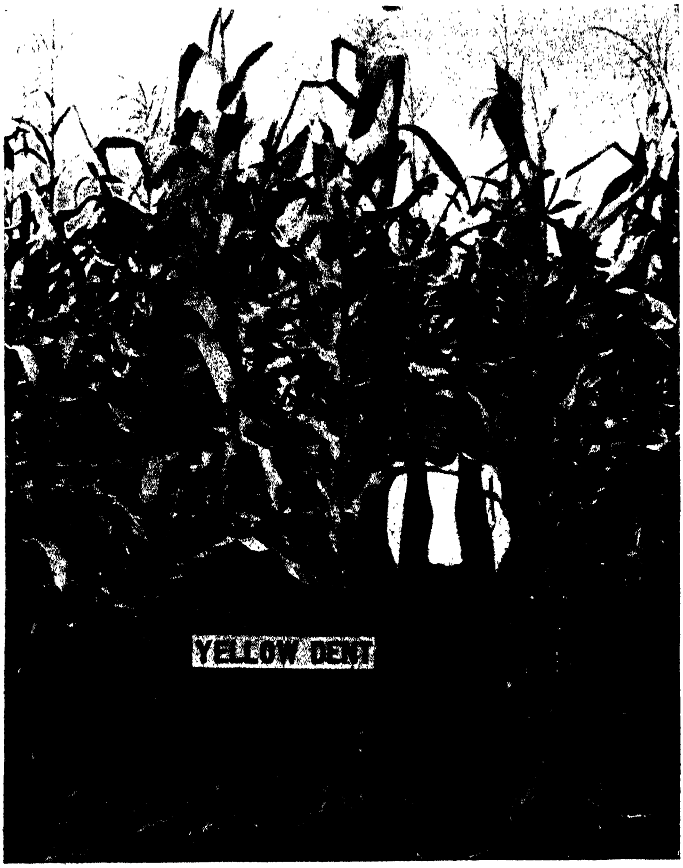
The improvement effected by Mr. A. H. Haywood when manager of Grafton Experiment Farm, was particularly in the direction of resistance to wet weather, by ensuring a good husk covering. On the North Coast it takes from five and a half to six months to mature, and ranks amongst the latest varieties grown in the State.

The stalk is only of medium thickness; indeed, considering the height sometimes attained, it is surprising how comparatively thin the stalk is. These characters make the variety specially valuable for green fodder, as the stalks are quite succulent compared with most coarse-growing late varieties. It attains a height of 12 to 15 feet on the North Coast, and does not sucker freely under ordinary conditions. The ears range from 5 to 7 feet on the stalk, and though mostly erect at maturity, they are being slowly made by field selection to acquire a drooping habit. The husk covering is extremely good, and on this account it is not only greatly resistant to the weather but also to the attack of the weevil. The shank is stout and of moderate length.

Improved Yellow Dent at Grafton Experiment Farm, 1916-17.

The ear is cylindrical and the standard varies in weight from 14 to 18 oz. The length is rather shorter than would be expected for a late maturing variety, ears over 10 inches in length being seldom found. The circumference of the ear is about 7½ or 8 inches. The dent is medium rough to rough (not extremely pinched), and the rows vary from fourteen to eighteen (occasionally twenty), and are mostly straight, except in some ears at the butt. The tip is not usually well filled, and the butt is only moderately rounded. There is a medium furrow between the rows, and the grain is fairly tight on the cob.

The grain is of moderate thickness, $\frac{6}{16}$ to $\frac{7}{16}$ inch broad and $\frac{9}{16}$ to $\frac{10}{16}$ inch deep, and the colour is bright amber or golden. It is one of the best selling varieties on the market on account of its attractive appearance, which is an indication of good bushel weight and feeding value. The cap of the grain is orange yellow in colour, and of medium size. The germ is of medium to large size, and the grain will average between 1,000 and 1,100 to the lb. The shelling percentage is about 82, which is rather good for a late variety.

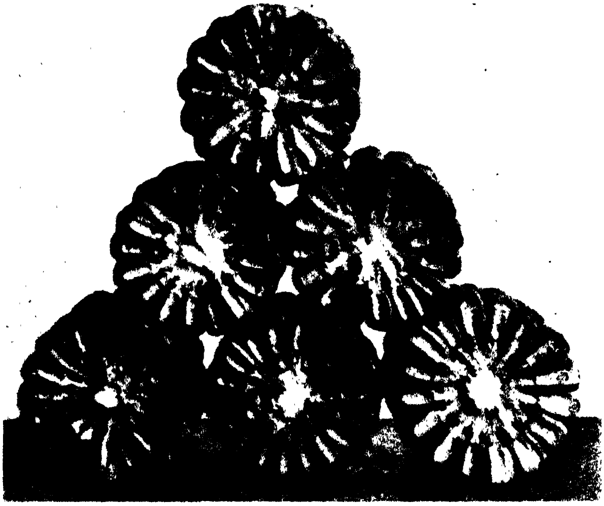


Improved Yellow Dent, grown at Mr. D. W. Baker's Farm, Coramba, in 1914.

Yielded 18 tons 18 cwt. per acre of green fodder.

At Tinonee (Manning River) last season (1916), a yield of 112 bushels of grain per acre was obtained with acclimatised seed of this variety; at Coramba (North Coast) it yielded 90 bushels per acre in 1913; at Albion Park (South Coast), 93 bushels per acre in 1915; and at Pambula (South Coast), 81 bushels per acre in 1915.

At Tilba (South Coast) in 1910 a yield of 45 tons of green fodder was obtained; at Jones Island (Manning River), 31 tons per acre in 1910; at Bega (South Coast), 29 tons per acre in 1911; at Mittagong (Southern Tableland), 21 tons per acre in 1913; and at Gulgong (Western Slopes), 15 tons per acre in 1910.



Improved Yellow Dent, showing the type of Grain and Core.

Red Hogan.

The early history of this variety is not definitely known. It seems to be one of the oldest varieties of maize grown in the State, and it has been known on the Hawkesbury River flats for over 50 years. It is not known whether it was originally obtained from America, but there does not seem to be any variety grown at the present time in the United States which is anything like Red Hogan in type and maturing period.

This variety is extremely popular on the Hawkesbury River flats and on the Lower Hunter, where it probably occupies a larger area than all other varieties together.

It is late in maturing—being one of the latest varieties grown in the State. On the Central Coast it takes about six or six and a half months to mature, and is, by reason of its long-growing season, greatly resistant to such dry spells during its early growth as frequently occur in the Hawkesbury district.

It is best sown for grain on the Central Coast from September to November, and has produced over 100 bushels per acre when sown in either of these months.

It does not produce as tall a growth of stalk as Improved Yellow Dent, and the average height is usually from 10 to 12 feet. The stalk is, however, much coarser than, and not as palatable as, Improved Yellow Dent. It is, therefore, not recommended for green fodder when this other variety can be obtained. Red Hogan does not usually produce many suckers, even on rich soil, or when planted more thinly than usual. A thin stand will rather make up for the deficiency by producing two or more ears per stalk. The ears are borne rather high on the stalk, many of them being well over half the stalk height. In spite of this disadvantage, the stoutness of the stalks usually keeps them from breaking in a heavy wind. The ears are often held erect, owing to the short thick nature of the supporting shank, but they are mostly resistant to the weather owing to the good covering of the husk.

The ears are cylindrical in shape, and the standard size weighs from 14 to 18 oz., is 9 to 11 inches long, and 7½ to 8 inches in circumference. The dent is medium to somewhat rough, but should never be very pinched. The number of rows may be fourteen or sixteen (seldom eighteen), and they are often irregular at the butt. The tips are usually well filled, and the butt moderately well rounded. There is a medium space between the rows, and the grain is mostly firm on the cob.

The grain is fairly thick, $\frac{6}{16}$ to $\frac{7}{16}$ inch broad and $\frac{9}{16}$ to $\frac{10}{16}$ inch deep. The colour of the grain should be a bright medium red—neither too dull nor too dark. The cap is fairly large, and the germ of small to medium size. The shelling percentage is about 83—a very good figure indeed for a late variety. About 1,000 grains weigh 1 lb.

There is perhaps no other variety which shows so much variation in colour in the bulk sample as Red Hogan. The colour varies from dark red to a distinct yellow—due, no doubt, to previous crossing with a yellow variety, but it may be considerably improved by selection for the right colour—a medium red. Yellow ears without any trace of red are sometimes picked out and called "Yellow Hogan." It is believed that such a strain is largely grown on the Shoalhaven (South Coast). The Red Hogan described here is known on the market and amongst seedsmen as "Large Red Hogan," to distinguish it from "Small Red Hogan," which is an early variety with small red grain, and is entirely different to "Large Red Hogan."

In 1916 a yield of 105 bushels per acre was obtained at Miller's Forest (Hunter River), and in 1914 100 bushels per acre were harvested at Hawkesbury Agricultural College River Farm.

Boone County White.

This variety, which also sometimes goes under the name of "Boone County Special," is of American origin, having been evolved by Mr. Jas. Riley, of Indiana, U.S.A., in 1876. It is another variety which (like Leaming) bears a tribute to the value of selection. It was originated by Mr. Riley by selection for earliness and for a high percentage of grain, from an old white Mastodon variety.

It is a variety which wins a large number of prizes at corn shows because of its uniform, regular appearance. It gives its best results on rich soils, and does not seem to be suited to soils of only moderate fertility unless it is plentifully supplied with water. It also seems to be one of the best varieties for wet soils, such as are found in low-lying situations, or when the season has been unduly wet, or where the rainfall is rather high, but it does not seem to stand too hot a climate, and therefore does better on the South Coast than on the North Coast of this State.

It matures in about five months under South Coast conditions, and is more suitable for October sowing in that district.

Boone County White.

The stalks do not grow very tall, and they are fairly coarse and stand up well against strong winds. They do not sucker very much even on rich land, and although sometimes more than a single ear per stalk is produced, good conditions tend to increase the size of the single ear more than anything else. The ears are borne at a moderate height on the stalk by shanks of medium length, which usually allow the ears to droop at maturity. The husk covering is fairly good.

The ears are cylindrical in shape, with a standard weight of 14 to 18 oz., length 9 to 11 inches, and circumference 7 to 7½ inches. The dent is rough and often pinched. The rows vary from sixteen to twenty, and are usually very straight and regular. The space between the rows is medium to small, and the tip is well filled and the butt very well rounded.

The grains are fairly tight on the cob, fairly thick, $\frac{5}{16}$ to $\frac{6}{16}$ inch broad, and $\frac{8}{16}$ to $\frac{9}{16}$ inch deep. The grain is a pearly white colour, with a small cap and a germ of medium size. The cores are medium large, but chaffy and light in weight in proportion to their size. The ears usually shell about 83 to 85 per cent. of grain. One pound of grain contains about 1,100 kernels.

Boone County White

At Kangaroo Valley (South Coast) in 1914 a yield of 80 bushels per acre was obtained. At Berry Experiment Farm, where the land is poor and drains badly, 68 bushels per acre were harvested from a plot manured with superphosphate and bone dust.

(*To be continued.*)

WAR CHEST DAY, 28TH SEPTEMBER, 1917.

IN connection with this effort, the women of the Public Service have arranged to hold a Village Fair at Queen's Square, Sydney, and the promoters of the produce stall, to be controlled by representatives from the Department of Agriculture, will be grateful for donations of eggs, poultry, butter, cheese, hams, bacon, jams, fruit, vegetables, or any similar produce, from any reader of the *Agricultural Gazette.*

Donors are requested to send their contributions in time to reach Sydney not later than 27th September, addressed to the Correspondence Branch, Department of Agriculture, Lands Building, Bridge street, Sydney.

Farmers' Experiment Plots.

MAIZE AND BROOM MILLET EXPERIMENTS, 1916-17.

LOWER NORTH COAST.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

MAIZE experiments were conducted during the season 1916-17 at Wauchope and Miller's Forest, and with the good season experienced, some heavy yields resulted. Tests with broom millet were also conducted at the latter centre. The names of the experimenters were as follows:—

Mr. J. W. Smith, Wauchope.
Mr. J. G. Perrett, Miller's Forest.

The Wauchope Plot.

This was sown on the 14th November, 1916, on land which had borne a late crop of maize the previous year. The soil was in fairly good condition at the time of sowing, except that little moisture was present. The ground had been under maize for two years previously, and before that it had been down to pasture for about twelve years. Furrows were opened out with the middle tine of a single-horse cultivator, and the seed planted with the maize drill in the shallow furrow so formed, the fertiliser being applied at the same time through the manure box on the drill.

The germination of all the varieties was very good throughout. As rain fell soon after planting the whole plot was harrowed over to loosen the surface of the soil, which is a clay loam and somewhat inclined to run together on wetting. Further rain fell after the plants were through the ground, and it was intended to harrow when the plants were about 3 or 4 inches high, but it was impossible to get on to the ground again until the plants grew to about 8 or 9 inches. A harrowing was then given, and the plants grew very rapidly. When they were 2 feet high, the whole field was cultivated with the disc cultivator, throwing a small hill to the rows. With the heavy December rainfall it was difficult to keep down the growth of weeds and grass in this district, but the cultivation described here kept this plot absolutely clean and free from such growth. At the tasselling stage there was not a single weed or bit of grass to be seen throughout the plot, and all the varieties looked very well. The weather was getting somewhat dry at this time, and rain was needed, especially for the early varieties. This rain came somewhat late for these, but it was in time for the later ones, notably the Improved Yellow Dent. Of the others, Giant White, Yellow Mastodon, Leaming, and Gold Standard Leaming, looked well at this stage. Rain came just after this. Although not much in actual amount, it was accompanied by such cold and unseasonable weather, with marked absence of sunshine, that leaf blight (*Helminthosporium*) broke out and attacked all the varieties except Leaming, Improved Yellow Dent, and Golden Nugget (a local variety). This blight was fairly general throughout the district in the late-sown crops, and also in many of the early crops, which also met with cool weather during growth. It is significant that, in the case of the three varieties which escaped the blight, the seed was grown on the North Coast, and therefore more acclimatised. The first two varieties have been recommended for the North Coast by the Department for several years. The local variety (Golden Nugget), which is grown by Mr. Smith, and which, it is contended, does well on soils of moderate fertility and in dry seasons, is worth watching, and is being further tested by the Department. In all the other varieties under trial, the seed was produced on the South Coast. Of these, it was observed that before the blight made any headway in them, Gold Standard Leaming, Goldmine, and Giant White promised very well, especially the last-named, some of the cobs being very large. These varieties were, however, badly attacked by the blight, which made its way into the stem, and was the cause of a lot of stalks going down with the wind. The fact that some varieties resisted the blight, and also the fact that sound ears with plump and well-filled grain were obtained from the most badly affected varieties, seem to indicate that resistance to this blight can be increased by selection. The low yields from all the varieties affected were caused by the large amount of pinched and shrivelled grain—but otherwise quite sound and free from any sign of disease. It seems that this disease is not conveyed through the seed by inoculation, as is smut and other fungi, but rather seems to be in the first place seasonal or climatic to a large extent. It is usually more prevalent in seasons which give a less than normal amount of sunlight, and it occurs more frequently in late-sown crops, especially when they are early varieties. It is probable that the disease is carried over several seasons in the soil, and awaits a favourable one to make its presence felt. The selection of seed from healthy plants in an affected crop is to be further tested to find the value of this method of combating the disease.

The yields of the plots were as follows:—

Variety.	Yield per acre.	
	bus.	lb.
Golden Nugget	62	42
Gold Standard Leaming	37	0
Goldmine...	38	24
Leaming	56	24
Yellow Mastodon	37	4
Hickory King	44	8
Giant White	45	44
Improved Yellow Dent...	78	12

All varieties were manured with a mixture of superphosphate and bone dust in equal quantities at the rate of 2 cwt. per acre.

The best yields were obtained from the varieties which escaped the blight, and the success of Improved Yellow Dent, which has been recommended for several years by the Department for the North Coast, is again to be noted. Leaming has also generally given good results on this farm.

The following are the results of a manurial trial, using Improved Yellow Dent as the variety throughout :—

Manure.	Yield per acre.		Increase or Decrease per acre.		Value of Increase or Decrease per acre.		Cost of Manure per acre.		Profit or Loss per acre.	
	bus.	lb.	bus.	lb.	s.	d.	s.	d.	s.	d.
No manure	83	40	......		......		......		......	
2 cwt. P7 mixture .. .	78	12	(–) 5	28	(–) 16	6	15	0	(–) 31	6
1¼ cwt. P5 mixture	87	12	3	28	10	6	9	3	1	3
1 cwt. Superphosphate .	79	16	(–) 4	24	(–) 13	4	4	11	(–) 18	3
1 cwt. Superphosphate ¾ cwt. Nitrate of Soda top-dressing	85	12	1	28	4	6	21	5	(–) 16	11

Maize, for the purpose of this calculation, is valued at 3s. per bushel. P7 mixture consists of equal parts of superphosphate and bone-dust, and P5 mixture of 4 parts superphosphate to 1 of sulphate of potash, which is valued at the pre-war price. The top-dressing of nitrate of soda was given by broadcasting between the rows, eight weeks after planting.

The yields from the manured plots were disappointing, the only manure to pay for its cost being P5. Comparing the two plots which received superphosphate, one of which was top-dressed with ¾ cwt. of nitrate of soda, the increase due to top-dressing was 5 bushels 52 lb. per acre, representing a value of 17s. 10d., while the cost of the manure was 16s. 6d. per acre.

The rainfall during growth was as follows :—November, 169 points ; December, 868 ; January, 290 ; February, 279 ; March, 283 ; April, 211 ; or a total of 21 inches.

The Miller's Forest Plot.

This plot was sown on 7th November, 1916, on good alluvial soil, typical of the district, which bore a crop of broom millet the previous season. It was ploughed early in autumn, and cultivated through the spring, until it was in excellent condition for sowing—if anything, rather too fine if much rain was to follow. Moisture was abundant at 3 or 4 inches below the surface, and the maize was drilled in on the level without opening up furrows for the drill.

On account of heavy rain in December, which was very continuous, it was impossible to get on to the ground for cultivation for a month or so after planting. The result was that much grass gained headway. In spite of this the maize grew fairly well, but the broom millet was decidedly backward, and in fact looked very poor. The manured plots of broom millet were, however, slightly more forward than the unmanured plots at this stage. Later, a very heavy rain and hail storm on 20th December (during which

230 points of rain were recorded) stripped the leaves of the maize to some extent. By the beginning of February the maize had come ahead well. Leaming and Hickory King were fully in silk, and Improved Yellow Dent and Red Hogan were just commencing to silk, and were about 8 to 9 feet high.

The stand was somewhat on the thick side, but the ground gave every appearance of being able to carry it. At the cobbing stage both Leaming and Hickory King were showing many stalks with two ears, but Improved Yellow Dent and Red Hogan only bore a single ear per stalk. There was no difference observable between the manured and unmanured plots of either maize or broom millet at this stage. The broom millet was commencing to show signs of "red blight," which is common in sorghum during a wet season on the coast. The maize, however, was entirely free from any trace of disease.

The following are the results of the maize variety trial:—

Variety.	Yield per acre.	
	bus.	lb.
Red Hogan	105	24
Improved Yellow Dent...	92	4
Leaming	86	39
Hickory King	67	14

No manure was used with any of these varieties.

Red Hogan is a popular variety in this district, and the yield recorded should even have been exceeded if it had been possible to keep the ground clean during the early growth. The poor results from Hickory King, as compared with the other varieties, clearly show that it is one of the worst yielding varieties for rich soil. Too many farmers take a fancy to it on account of its large attractive grain without any regard to its yielding capacity. It does comparatively better, however, on soils of poor or average fertility.

The following are the results of the manurial trial, in which Improved Yellow Dent was used throughout:—

Manure per acre.	Yield per acre.		Increase or Decrease per acre.		Value of Increase or Decrease per acre.		Cost of Manure per acre.		Profit or Loss per acre.	
	bus.	lb.	bus.	lb.	s.	d.	s.	d.	s.	d.
No manure	92	4	...	.	..	...	.....		...	..
1¼ cwt. P5 mixture	79	55	(–)12	5	(–) 36	3	9	3	(–) 45	6
2 cwt. Superphosphate... ...	79	14	(–)12	46	(–) 38	6	9	9	(–) 48	3
2 cwt. P7 mixture	95	49	3	45	11	6	15	0	(–) 3	6

The decrease in yield from two of the manured plots cannot be explained. P7 manure, consisting of equal quantities of superphosphate and bone-dust, gave nearly 4 bushels per acre extra, but this increase did not pay for the cost of the manure.

A manurial experiment with broom millet resulted as follows:—

Manure per acre.	Yield per acre.			Increase or Decrease per acre.	Value of Increase or Decrease per acre.		Cost of Manure per acre.		Profit or Loss per acre.	
	c.	q.	lb.	lb.	s.	d.	s.	d.	s.	d.
No manure	8	1	19	......	...		......		......	
2 cwt. P7 mixture	8	2	13	22	5	11	15	0	(–) 9	1
2 cwt. Superphosphate ...	8	1	4	(–) 25	(–) 6	8	9	9	(–) 16	5
1½ cwt. W3 mixture... ...	8	1	25	6	1	7	10	11	(–) 9	4
1 cwt. Superphosphate .	8	2	20	29	7	9	4	11	2	10

Three of the manures gave additional yields, but only one of them a sufficient increase to pay for the cost of the manure. The yields were not good, owing to too much wet and cold weather in December preventing the crop getting a good start. The broom millet, for the purpose of calculation, was valued at £30 per ton.

The rainfall during growth was as follows:—November, 395 points; December, 718; January, 689; February, 215; March, 191; or a total of 22·08 inches.

Maize and Broom Millet Compared.

On this part of the Hunter River there is a larger acreage devoted to broom millet than to maize, and a comparison of the returns of the two crops on this experiment plot is interesting. The average yield of maize throughout the plot here was 87 bushels 20 lb. per acre, representing a gross return of £13 2s 1d. per acre. The average yield of broom millet was 8 cwt. 1 qr. 27 lb.—a gross return of £12 15s. 9d. per acre. If Red Hogan maize had been used throughout, there would have been a return of £15 16s. 3d. per acre. The prices allowed for both these products are not as high as in more normal seasons. The cost of production would be somewhat higher in the case of the broom millet, owing to the greater amount of labour involved in handling the crop. As against this, however, it must be urged that the yields of maize were higher, and those of broom millet lower, than is obtained in an average season. Maize is a crop which is greatly influenced by weather conditions, particularly at cobbing time, whereas this is not the case with broom millet. On account of this fact, it is usually agreed that broom millet is more dependable, on the average, than maize. Ten cwt. of broom millet per acre is usually obtained in an average season, whereas a 60 or 70 bushel crop of maize is considered a fair average. This would place broom millet as more profitable; but because seasons do occur in which maize is a better paying crop, it is likely that its culture will continue, at least on small areas on most farms in this district.

The Prickly Pears of Interest to Australians.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

No. 15. *Opuntia vulgaris* Miller.

No *Opuntia* name has, in times past, been more used in Australia than the present one, and yet *O. vulgaris* has never been found as an escape from cultivation in any part of Australia, and, so far as I know, there is no specimen in existence in any part of Australia out of the Sydney Botanic Gardens, where a plant continues an uncertain existence, our summer temperatures being very trying to it. It rarely flowers, and still more rarely sets fruit. After sixteen years' watching I have not, so far, seen ripe seeds.

How the name came into use in Australia.—Mueller uses the name " *Opuntia vulgaris* Miller " for the ordinary Prickly Pear, describing it thus :—" Central America, northward to Georgia, southward to Peru. Very hardy. Adapted for big hedges (*sic*), and like the rest, not inflammable, hence particularly valuable along railway lines . . . . Numerous other species are industrially eligible for hedging purposes, but sometimes spreading much beyond control, particularly in warm climes." (*Select Extra-tropical Plants*, various editions from 1876 onwards.)

The above description is evidently a mix-up of *O. ficus-indica* (see No. 6 of this series, *Agricultural Gazette,* January, 1913) and the pest pear, *O. inermis* var. (see No. 4 of this series, *Agricultural Gazette,* August, 1912).

The New South Wales Parliament in 1886 passed " An Act to provide for the eradication of the Prickly Pear." (50 Victoria, No. 2. Assented to, 30th July, 1886.)

In the " Interpretation of terms " we have the following :—

" Prickly Pear means the plant known by the botanical name of *Opuntia vulgaris*, or the common Prickly-pear, and any other variety of the cactus tribe which the Governor may declare to be prickly pear for the purpose of this Act."

In the " Instructions to Inspectors under the Prickly Pear Destruction Act of 1886 " we have :—

11. It will be the Inspector's duty to make himself acquainted with the *Opuntia vulgaris*, or common Prickly-pear, and the different kinds of cactus.

The common Prickly-pear, as described by the Director of the Botanic Gardens :—

Opuntia vulgaris.—Plant diffusely prostrate, seldom rising above 2 feet in height; joints ovate or nearly so, about 6 inches in length, dotted on both surfaces with sparse bundles of numerous very short spines; flowers yellow; fruit about size of pullet's egg, purple when ripe, dotted at intervals with very short spines in small bundles.

Note.—This plant may be distinguished from all other prickly-pears by its light dull-green colour and low spreading habit.

The late F. M. Bailey used the name *vulgaris* for the pest pear.

In his "Queensland Flora," p. 704 (1900), he only admitted two species for Queensland, viz., (1) *O. vulgaris*, which is the pest pear, *O. inermis* var., and (2) *O. ferox*, which is *O. aurantiaca* (see No. 1 of this series, *Agricultural Gazette*, April, 1911).

In his "Weeds and Suspected Plants of Queensland," p. 60 (1906), he keeps to the same two species.

In his "Comprehensive Catalogue of Queensland Plants" (dated 1909, but not published till 1913), he, at p. 222, retains *vulgaris* and *ferox*, but as regards the former he adds that the "great pest" is most probably a form of *O. Dillenii.* Those who desire to see what *O. Dillenii* is are referred to No. 9 of this series (*Agricultural Gazette*, December, 1913).

Bailey also adds *O. Tuna* and *O. monacantha*, which I have dealt with in No. 3 (*Agricultural Gazette*, March, 1912) and No. 7 (*Agricultural Gazette*, October, 1913). His *O. Tuna* is probably *O. nigricans* (see No. 3).

I have already stated that there is no *O. vulgaris* in Australia, except the specimen in the Sydney Botanic Gardens, and what is referred to is the pest pear, *O. inermis* var. (see No. 4 of this series, *Agricultural Gazette*, August, 1912, p. 714, last paragraph but one).

As an example of the intricacy of the synonymy of Prickly Pears, a recent work of the highest class, "Addisonia," Plate 38 (published by the New York Botanic Garden), says that *Opuntia vulgaris* Miller is a totally different plant. It calls it the "Tall South American Prickly Pear," and gives no less than seven botanical synonyms, one of which is *O. monacantha* Haw., figured as No. 7 of the present series (*Agri. Gaz.* for October, 1913.)

At the end of the descriptive matter in "Addisonia" is a useful note, of which the following is a part, "The name *Opuntia vulgaris*, as given by Miller as above cited, refers to this plant rather than to the wild Prickly Pear of the eastern United States, with which it has been associated in much botanical literature."

Some years ago I recommended the Department charged with the eradication of the Prickly Pear to declare *all* Prickly Pear noxious, and to make exceptions, as may be deemed necessary, in regard to Prickly Pears proved to be unobjectionable from time to time. This would prevent fulminations in the *Government Gazette* against four species of Prickly Pear, three of which are not in the country. One of the objects of this series of articles is to clear up the confusion which has gathered thick about Prickly Pears, so far as Australia is concerned—a confusion that is by no means confined to Australia.

Description of the true O. vulgaris.—I have not access to the 8th edition of Miller's "Gardeners' Dictionary" published in the eighteenth century, which contains the original description.

Those who desire a side-light into the intricacies of the early synonymy of this species, may refer to my article in this *Gazette* on the subject (p. 992, 1898). It is not necessary to repeat what was then stated. The confusion is very great. The description of *O. vulgaris* given at p. 994 is unreliable, as being partly based on the pest pear. My paper of 1898 was the first comprehensive paper on Opuntias published in Australia; and since it was published I have cultivated an enormous quantity of Prickly Pears, have travelled in all the States specially inquiring into them, and have undertaken the investigation of certain problems connected with the effect of poisons on the pear pest at Scone for the New South Wales Government. I can, therefore, speak with much more definiteness than was possible nearly twenty years ago.

Following is the description from Don's *Dichlamydeous Plants* iii, 175 (1834), which is mainly a translation of *Succulent Plants*, A. H. Haworth, p. 190. It is the first description in English known to me :—

> *O. vulgaris* (Mill. *Dict.* ed. 8, No. 1. Haw. *Syn.* p. 190), plant diffusely prostrate, rooting; joints ovate; prickles unequal, very short, and very numerous. Native of North America, in the southern states; plentiful in the neighbourhood of New York. &c.; and now frequent in the south of Europe. Hook. *Bot. Mag.* 2393. *Cactus Opuntia*, Lin. spec. 669. *Cactus Opuntia vulgaris et nana*, D.C. *Pl. Grass*, No. 138, with a table (plate)—Mill. fig. t. 191. Flowers yellow, spreading.
>
> Common Indian-fig or Prickly Pear. Fl. July, Aug. Clt. 1596. Shrub ½ to 1 foot, but usually prostrate and rooting.

Explanation of Plate.—The plant figured herewith is that commonly known as *O. vulgaris* in Europe, and springs from a joint forwarded to me by Dr. Hochreutiner, of Geneva, Switzerland. Although an American plant, it was described by an Englishman, and it is assumed that European botanists have not lost the identity of it.

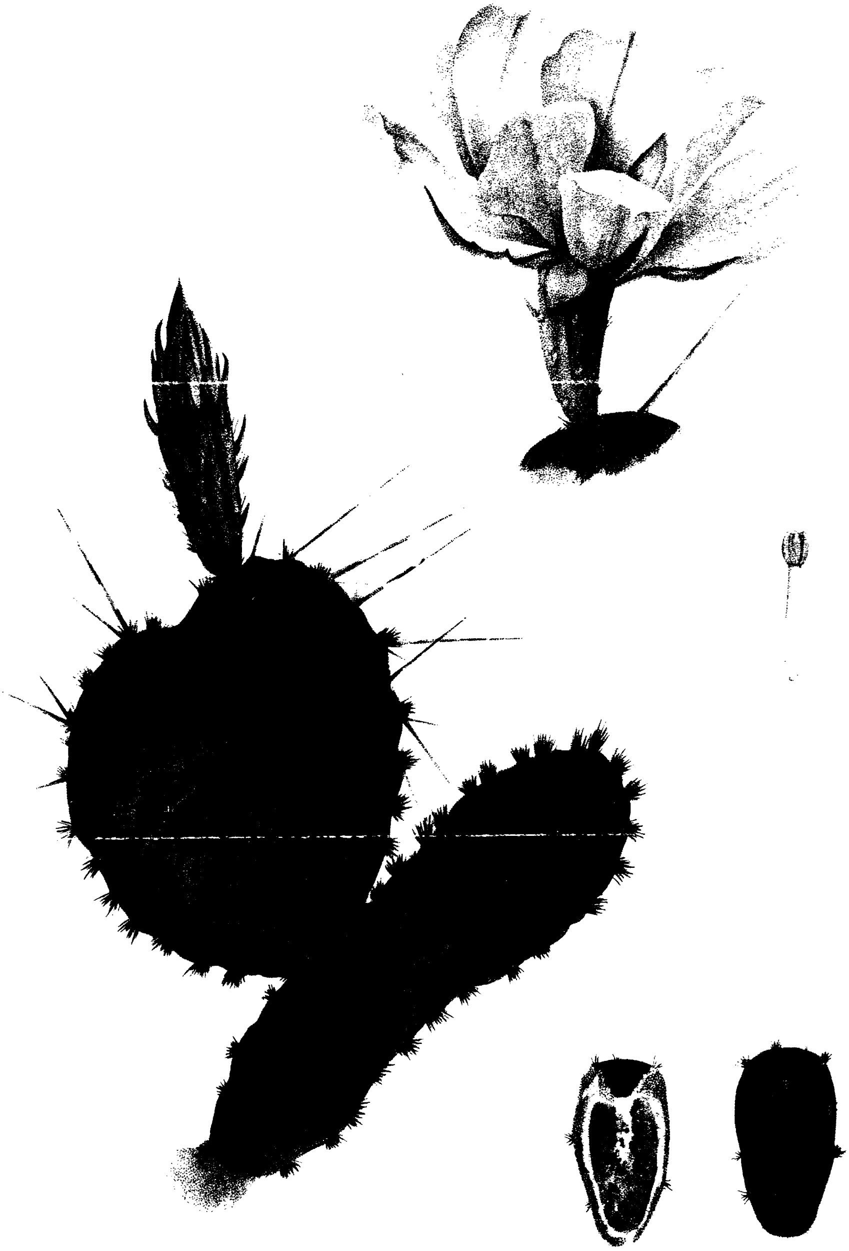
[Incidentally I may state that some recent authors desire to revive the name *O. nana* V's. for *O. vulgaris*, but I see no justification except the confusion that has gathered round *O. vulgaris*. I do not think that such an extreme measure is necessary; it is setting a dangerous precedent.]

SEED TESTING FOR FARMERS.

THE Department is prepared to test vegetable and farm crop seeds. Reports will be given stating the germination capabilities of the seed, its purity, and the nature of the impurities, if any.

Communications should be addressed to the Director, Botanic Gardens, Sydney. Not less than 1 ounce of small seeds such as lucerne, or 2 ounces of large seeds like peas, should be sent. Larger quantities are to be preferred. Seeds should be accompanied by any information available as to origin, where purchased, age, &c.

If a purity report only is desired, it should be so stated, to secure a prompt reply. Germination tests take from six to twenty days, according to the seed.



The Twenty Worst Weeds of New South Wales.

[Previous reference, *Agricultural Gazette*, November, 1915, p. 981.]

J. H. MAIDEN, I.S.O., F.R.S., F L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

THE accompanying table is the best guide to the relative importance of weed pests in this State at the moment of publication. At the same time, it must be borne in mind that its completeness is entirely dependent on certain official acts of shires and municipalities, and local government bodies naturally differ somewhat in the importance they attach to many weeds.

Attention is invited to the following:—

1. It will be observed that in the case of *Rosa rubiginosa* (Sweet Briar), it is now proclaimed in three fewer areas than in 1915. The explanation is that, since 1915 some areas have been reconstituted, and some local authorities have not taken action with a view to having the weed declared noxious in their newly defined areas.
2. Similar observations are true as regards *Inula graveolens* (Stinkwort).
3. It will be seen that the Bathurst Burr continues preponderatingly at the top of the poll. It is, indeed, in a class by itself, always excluding the Prickly Pear (*Opuntia*).
4. The Noogoora Burr, which is quite a new chum in New South Wales, having only been recorded in 1896, has now passed the Sweet Briar for fourth place.
5. The Saffron Thistle has superseded the Cape Weed for eighth place.
6. The Water Hyacinth (for the destruction of which there is special legislation) has gone up two places, but this may be the result of increased local activity, not of relative increase as compared with Thorn-apple and Stinkwort.
7. The case of the Narrawa Burr (now eighteenth) is interesting, because it is the only native weed in the list, and the attention of students of ecology will be directed to it.
8. The Cockspur was not in the 1915 list.

WEEDS proclaimed Noxious within Municipalities and Shires in the State of New South Wales.

Weeds	Up to June, 1915.				Up to May, 1917.			
	Number of—				Number of—			
	Municipalities.	Shires.	Total.	Sequence.	Municipalities.	Shires.	Total.	Sequence.
Xanthium spinosum (Bathurst Burr)	91	100	191	1	93	99	192	1
Rubus fruticosus (Blackberry) ...	42	46	88	2	42	46	88	2
Centaurea calcitrapa (Star Thistle or Chinese Burr)	34	49	83	3	33	50	83	3
Xanthium strumarium (Noogoora Burr)	23	45	68	5	24	47	71	4
Rosa rubiginosa (Sweet Briar) ...	28	43	71	4	27	41	68	5
Carduus lanceolatus (Black Thistle or False Scotch Thistle, or Spear Thistle)	46	7	53	6	46	7	53	6
Echium plantagineum (Paterson's Curse or Purple Bugloss or Blue Weed)	10	32	42	7	11	34	45	7
Carthamus lanatus (Saffron Thistle or False Star Thistle)	10	27	37	9	10	28	38	8
Cryptostemma calendulaceum (Cape Weed)	22	15	37	8	22	15	37	9
Lantana camara (Lantana) ...	17	13	30	10	18	17	35	10
Argemone mexicana (Mexican Poppy or Binneguy Thistle or White Thistle or Prickly Poppy or Yellow Poppy)	7	17	24	11	7	18	25	11
Eichhornia crassipes (Water Hyacinth)	7	12	19	14	7	17	24	12
Datura stramonium (False Castor Oil Plant or Thorn Apple or Green Stem or Purple Stem)...	12	8	20	13	15	9	24	13
Inula graveolens (Stinkwort) ...	7	14	21	12	7	13	20	14
Nicotiana glauca (Tree Tobacco or Tobacco Bush)...	5	13	18	15	5	14	19	15
Hypericum perforatum (St. John's Wort)	6	11	17	16	6	11	17	16
Phytolacca octandra (Red Ink Plant or Dye Berry or Ink Plant) ...	12	1	13	17	13	1	14	17
Solanum cinereum (Narrawa Burr)	5	7	12	19	5	7	12	18
Ricinus communis (Castor Oil Plant)	9	3	12	18	9	3	12	19
Centaurea melitensis (Cockspur) ...	......	...	...	...	5	5	10	20

Factories Registered under the Dairy Industry Act.

THE following is a list of the butter, cheese, condensed milk, and margarine factories in New South Wales which have been registered in compliance with the provisions of the Dairy Industry Act, 1915 :—

BUTTER FACTORIES.

Name.	Locality.
Acacia Co-operative Dairy Co., Ltd.	Acacia Creek.
Albury Co-operative Butter Factory and Produce Co., Ltd.	Albury.
Alstonville Co-operative Refrigerating and Carrying Co., Ltd.	Alstonville.
Argyle Co-operative Central Dairy Co., Ltd. ...	Goulburn.
Armidale Co-operative Butter Factory Co., Ltd.	Armidale.
Australian Chilling and Freezing Co., Ltd. ...	Aberdeen.
Australian Milk Products, Ltd.	Windsor.
Avon and Barrington Co-operative Butter Factory, Ltd.	Gloucester.
Bacchus Marsh Concentrated Milk Co., Ltd. ...	Bomaderry.
,, ,, ,, ...	Scott's Flat, *via* Singleton.
,, ,, ,, ...	Smithtown.
Ballina Co-operative Butter Factory	Ballina.
Barrengarry Dairy Co., Ltd.	Barrengarry.
Bathurst Co-operative Dairying Co., Ltd.... ...	Bathurst.
Bega Co-operative Creamery Co., Ltd.	Bega.
Bellinger Central Butter Factory	Fernmount.
Bemboka Co-operative Butter Co., Ltd.	Bemboka.
Binna Burra Co-operative Dairy Co., Ltd. ...	Binna Burra.
Black Mountain Dairy Co., Ltd.	Black Mountain.
Bodalla Co., Ltd.	Bodalla.
Bonalbo Co-operative Dairy Co., Ltd.	Bonalbo.
Bowraville Dairy Co., Ltd.	Bowraville.
Bowthorne Co-operative Butter Factory, Ltd. ...	Morpeth.
,, ,, ,, ...	East Gresford.
Branxton Milk and Butter Factory	Branxton.
Bullahdelah District Co-operative Dairy Co., Ltd.	Bulladelah.
Cadgee Co-operative Butter Co., Ltd.	Nerrigundah.
Camden Haven Co-operative Dairy Co., Ltd. ...	Kendall.
Candelo Co-operative Dairy Co., Ltd.	Bimbaya.
Casino Co-operative Dairy Co., Ltd.	Casino.
,, ,, ,, ...	Malanganee.
Cathcart Co-operative Dairy Co., Ltd.	Cathcart.
Cessnock Co-operative Dairy Co., Ltd.	Cessnock.
Clarence River Pioneer Dairy Co., Ltd.	Ulmarra.
Cobargo Co-operative Butter Factory	Cobargo.
Coff's Harbour Co-operative Dairying and Refrigerating Co., Ltd.	Coff's Harbour.
Comboyne Butter Factory	Comboyne.
Cootamundra Butter Factory	Cootamundra.
Copmanhurst Co-operative Dairy Co., Ltd. ...	Copmanhurst.

BUTTER FACTORIES—*continued.*

Name.	Locality.
Coraki Butter Factory	Coraki.
Country Freezing Co., Ltd.	Blayney.
" "	Canowindra.
" "	Orange.
" "	Parkes.
Crookwell Butter Factory Co., Ltd.	Crookwell.
Dapto Co-operative Dairy Co., Ltd.	Dapto.
Darbalara Butter Factory (Scottish-Australian Investment Co., Ltd.)	Darbalara Estate, *via* Gundagai.
Deepwater Co-operative Dairy Co., Ltd.	Deepwater.
Deniliquin Co-operative Butter Factory and F.P. Co., Ltd.	Deniliquin.
Denman Co-operative Dairy Co., Ltd.	Denman.
Dorrigo Co-operative Dairy Co., Ltd.	Dorrigo.
"Dubbo" Factory (Thomas A. Wright)	Dubbo.
Dungog Dairymen and Farmers' Milk and Ice Co., Ltd.	Dungog.
Dungog Co-operative Butter Factory, Ltd. ...	Dungog.
Farmers and Dairymen's Milk Co., Ltd.	Ultimo.
Foley Bros., Ltd.	Sussex-street, Sydney.
Frederickton Butter Factory (Frederick Debenham).	Frederickton.
Gerringong Dairy Co., Ltd.	Gerringong
Gleniffer Co-operative Dairy Co., Ltd.	Gleniffer.
Glen Innes Co-operative Butter Factory, Ltd. ...	Glen Innes.
Gloucester District Co-operative Butter Factory Co., Ltd.	Stroud.
Grafton Dairy Co., Ltd.	Grafton.
Gunnedah Co-operative Dairy Co., Ltd.	Gunnedah.
Hastings District Co-operative Dairy Co., Ltd ...	Port Macquarie.
Hawkesbury Agricultural College	Richmond.
Hay Co-operative Butter Factory, Ltd.	Hay.
Home Farm Butter Factory	Kameruka, Bega.
Illawarra Central Butter Factory	Albion Park.
Inverell Co-operative Butter Co., Ltd.	Inverell.
Jamberoo Co-operative Dairy Co., Ltd.	Jamberoo.
Jerilderie Co-operative Butter Factory and Cool Storage Co., Ltd.	Jerilderie.
Jerry's Plains Co-operative Butter Factory, Ltd.	Jerry's Plains.
Kangaloon Co-operative Dairy Co., Ltd.	West Kangaloon.
Kialla Butter Factory Co., Ltd.	Kialla.
Kyogle Co-operative Dairy Co., Ltd.	Ettrick branch.
" " "	Kyogle.
" " "	Wyangarie.
Lismore Co-operative Dairy Co., Ltd.	Corndale.
" " "	Lismore.
Maclean Co-operative Dairy Co., Ltd.	Maclean.
Macleay River Co-operative Dairy Co., Ltd. ...	Kempsey.
McDonald's Creek Butter Factory	Erudgere.
Manning River Co-operative Dairy Co., Ltd. ...	Jones' Island.
Menangle Central Creamery Factory (Camden Park Estate, Ltd.)	Menangle.
Mittagong Factory (Berrima District Farmers and Dairymen's Co., Ltd.)	Mittagong.
Mudgee Dairy Co., Ltd.	Mudgee.
Murrumbidgee Irrigation Commission	Leeton.
Nambucca Dairy Co., Ltd.	Macksville.
New South Wales Fresh Food and Ice Co., Ltd ...	Harbour-street, Sydney.
Nimbin Co-operative Dairy and Carrying Co., Ltd.	Nimbin.

BUTTER FACTORIES—*continued.*

Name.	Locality.
North Coast Co-operative Co., Ltd.	Byron Bay.
,, ,, ,,	The Channon.
,, ,, ,,	Dunoon.
,, ,, ,,	Lismore.
,, ,, ,,	Murwillumbah.
,, ,, ,,	Tweed Heads.
,, ,, ,,	Tyalgum.
,, ,, ,,	Uki.
Northern Central Creamery	South Lismore.
Nowra Co-operative Dairy Co., Ltd.	Nowra.
Orara Co-operative Dairy Co., Ltd.	Coramba.
Overton Butter Factory (Mr. Dan Blunt)	Muswellbrook.
Palmer's Island Dairy Co., Ltd.	Palmer's Island.
Pambula Co-operative Creamery & Dairy Co., Ltd.	Pambula.
People's Dairy and Manufacturing Association, Ltd.	Kangaroo Valley.
Peters' Paterson River Dairies, Ltd.	"Gostwyck," Martin's Creek.
Peters' American Delicacy Co., Ltd.	Redfern.
Poplar Grove Butter Factory	Quirindi
Quirindi Central Butter Factory	Quirindi.
Raleigh Co-operative Butter Co., Ltd.	Raleigh.
Raymond Terrace Co-operative Dairy and Produce Co., Ltd.	Raymond Terrace.
Red Range Co-operative Dairy Co., Ltd.	Red Range.
Robertson Dairy Co., Ltd.	Robertson.
Rocky Hall Co-operative Dairy Co., Ltd.	Rocky Hall.
Scone Co-operative Dairy Co., Ltd.	Scone.
Singleton Central Co-operative Dairy Co., Ltd.	Singleton.
Singleton Farming and Dairying Butter Factory	Singleton.
South Wolumla Creamery Co., Ltd.	South Wolumla.
Tamworth Co-operative Dairy Co., Ltd.	Tamworth.
Tooloom and Woodenbong Co-operative Butter Factory Co., Ltd.	Urbenville.
Tenterfield Co-operative Butter Factory, Ltd.	Tenterfield.
Towamba Central Co-operative Creamery Co., Ltd.	Towamba.
Tumut Butter Factory, Ltd.	Tumut.
Tweed River Co-operative Butter Co., Ltd.	Murwillumbah.
Ulladulla Refrigerating Butter Co., Ltd.	Milton.
Upper Bellinger Co-operative Dairy Co., Ltd.	Bellingen.
Upper Macleay Co-operative Dairying Co., Ltd.	Toorooka.
Upper Manning Co-operative Dairy Co., Ltd.	Purfleet.
Upper Wallamba River Co-operative Dairy Co., Ltd.	Dyer's Crossing.
Wagga Butter Factory	Wagga.
West End Creamery Co-operative Co., Ltd.	Moran's Crossing.
Wilde's Meadow and Yarrunga Dairy Co., Ltd	Wilde's Meadow.
Wingham and Upper Manning District Co-operative Butter and Bacon Co., Ltd.	Wingham.
Woodstock Central Dairy Co., Ltd.	Jamberoo.
Wyong Co-operative Dairy Co., Ltd.	Wyong.

CHEESE FACTORIES.

Arrawatta Cheese Factory	Arrawatta.
A.B.C. Dairy Factory Co., Ltd.	Central Tilba.
Allawa Cheese Factory	Dorrigo.
Angledale Cheese Factory	Angledale.
Apollo Cheese Factory	Coramba.
Arakoon Cheese Factory	Belloponini.
Ayrdale Cheese Factory	Wolumla.
Bangalow Cheese Factory (Northern Central Dairy Co.)	Bangalow.

CHEESE FACTORIES—*continued*.

Name.	Locality.
Barrabooka Cheese Factory	Tanja.
Bergalia Co-operative Dairy Co., Ltd.	Bergalia.
Bluff Cheese Factory (Tenterfield Dairy Co.)	Bluff Rock.
Box Range Factory	Pambula.
Binks Bros.	Broughton Village.
Brancourt, T. D.	Liverpool-road, Bankstown.
"Briandairy" Factory	Bega.
Bright Hills Factory	Candelo.
Buckago Cheese Factory (T. J. Bateman)	Buckago.
Bugle Factory (William Spence)	Bega.
Bylong Cheese Factory	Bylong.
Cedar Point Cheese Factory	Cedar Point.
Corunna Dairy Factory Co., Ltd.	Corunna.
Curtis, Walter	Brogo.
Dalmeny Factory (Mrs. T. A. Mort)	Dalmeny.
Deep Dene Factory (Mrs. A. Targett)	Tantawanglo.
Distant View (Mrs. D. Sercombe)	Tanja.
Dungog Co-operative Butter Factory, Ltd.	Dungog.
Elmgrove Factory (Geo. Guthrey)	Bega.
Erinna Co-operative Cheese Factory, Ltd.	Bega.
Essex Hill Factory	Tanja.
Eurobodalla Dairy Co., Ltd.	Eurobodalla.
Fairfield Factory (J. J. Bown)	Quaama.
Fernbank Factory	Kangaroo Valley.
Fernlee Factory	Bimbaya.
Greenwood Park Factory	Bodalla.
Grubben Cheese Factory	Wagga Wagga.
Harbour View Factory	Bateman's Bay.
Hawkesbury Agricultural College	Richmond.
Herdegen Co-operative Dairy	Upper Orara.
Hillcrest Factory	Dorrigo.
Home Farm Factory (Bodalla Co., Ltd.)	Bodalla.
Islands View	Narooma.
Jamberoo Co-operative Dairy Co., Ltd.	Jamberoo.
Jellat Jellat Cheese Factory	Bega.
"Kaewieng" Factory	Bega.
Kanoona Factory	Bega.
Kingaroy Factory	Hernani.
Kiora Co-operative Dairy Co., Ltd.	Moruya.
Koala Factory	Kinchela Creek.
Lachlan Ross, Ltd.	Taralga.
Lake View (Isaac Game)	Wallagoot.
Lake View (F. H. Anderson)	Bergalia.
Lane's XXX Kameruka	Candelo.
Lochiel (D. W. Hart)	Lochiel.
Mann's Cheese Factory (McMicking & Co.)	Tumbarumba.
"Mayfield" Factory (F. M. Du Ross)	Bergalia.
Meringlo Factory (Catherine Rheinberger)	Meringlo.
Mirrool Cheese Factory (The Water Conservation and Irrigation Commission).	Griffith.
"Moggendora" Cheese Factory (Margaret Heffernan).	Moruya).
Moruya Co-operative Dairy Co., Ltd.	Moruya.
Mount McKenzie Cheese Factory	Tenterfield.
"Mountain View" (H. J. Bate)	Tilba Tilba.
Mountain View (William Jauncey)	Bega.
Murrah Cheese Factory (Edgar O. Gowing)	Murrah.
Narooma Co-operative Dairy Co., Ltd.	Narooma.
"Niagara" Cheese Factory	Kameruka, Bega.

CHEESE FACTORIES—*continued.*

Name.	Locality.
Northern Central Dairy Co., Ltd.	Marom Creek.
Numerella Factory (Estate late John Otton) ...	Numerella.
Oak Branch Factory (J. C. Lavis)...	Dunn's Creek.
"Oaklands" Cheese Factory (Jas. Jauncey) ...	Bega.
Orion Cheese Factory (Estate late P. Hergenhan)	Bega.
Paradise Factory (R. Millard)	Nellingen.
Pigeondale Factory (T. Wilson)	Quaama.
Reidsdale Cheddar Cheese Factory	Braidwood.
Ritchie, H. B., "Limegrove" Factory	Tanja.
,, ,, "Hillside" Factory.	Tanja.
,, ,, "Penuca" Factory.	Bega.
"Rockleigh" Factory (J. Ainsworth)	Ballina.
"Rose Brook" Factory (Lucas Bros.)	Candelo.
"Rosebud" Factory (Cole Bros.)	Lochiel.
"Rosebud" Factory (E. C. Christenson) ...	Bateman's Bay.
"Runnymede" (M. Ryan)	Runnyford.
Schomberg, O., "Broadview" Factory	Brogo.
Sea View Cheese Factory (J. H. Wright)	Bateman's Bay.
Seven Oaks Factory (Jackson and Plummer) ...	Seven Oaks.
Sherringham Factory (H. and C. Hoyer)	Sherringham.
"Springvale" Cheese Factory (E. H. Filmer) ...	Candelo.
Springhill Factory (E. E. Gilkes)	Tilba Tilba.
Stiles, E. F.	Bega.
Strathclyde Cheese Factory (Gill Bros.)	Brooman.
Sunnyside Factory (T. Gorman)	Mogo.
Taylor's Arm Cheese Factory (C. Johnson) ...	Taylor's Arm.
Tenterfield Dairy Co.	Tenterfield.
"The Island" Cheese Factory (Kameruka Estate)	Bega.
The Meadows Cheese Factory (D. A. Gowing) ...	Bega.
Thomson, H.	Tomakin.
Trunkettabella Cheese Factory	Bodalla.
View Mount Factory (J. and T. Walsh)	Verona.
Wandella Cheese Factory (John McVeity)... ...	Wandella.
Wangruka Cheese Factory (J. G. Boxsell) ...	Cobargo.
Water Conservation and Irrigation Commission ...	Leeton.
Wattalia Factory (Walter Dolton)	Tathra.
Wollongbar Experiment Farm	Wollongbar.
Wolseley Park Co-operative Dairy Co., Ltd. ...	Wolseley Park.
"Wolumla" Cheese Factory (Kameruka Estate)	Bega.
Woodstock Cheese Factory (Yatteyatah Co-operative Cheese Factory, Ltd.	Milton.
Wright, T. A....	Coolah.
Yarranung Cheese Factory (Estate late P. H. Wood).	Bega.
Yatteyattah Co-operative Cheese Factory, Ltd. ...	Milton.

CONDENSED MILK FACTORIES.

Australian Milk Products, Ltd.	Windsor.
Bacchus Marsh Concentrated Milk Co., Ltd. ...	Bomaderry.
,, ,, ,, ...	Smithtown.
,, ,, ,, ...	Scott's Flat, *via* Singleton.
Branxton Milk and Butter Factory	Branxton.

MARGARINE FACTORIES.

Australian Margarine Factory	Leichhardt.
Kitchen and Sons, Ltd.	365 Kent-street, Sydney.
Marrickville Margarine Co., Ltd.	Marrickville.
New South Wales Canning Factory	Waterloo.

Official Milk and Butter Records.

M. A. O'CALLAGHAN.

THE year 1917 promises to be a productive one in the way of milk and butter records by officially tested cows.

Last month I had the pleasure of giving particulars of some new performances that were better than anything previously put up, but this month better ones still can be chronicled.

Melba VII of Darbalara has put the Shorthorns in the forefront, as, with her record of 14,371 lb. of milk and 836 lb. of butter, she is ahead of anything up to date. She is run very closely, however, by one of Mr. C R. G. Macdonald's high-producing Jerseys, Brighton Vanilla II having produced 808 lb. of butter from 14,867 lb. of milk. The most interesting point in connection with these two cows is that on the average the Shorthorn has given the higher test of the two.

As both of these cows are producing heavily at the present time, and as both will probably be tested for a period of twelve months, it will be very interesting, indeed, to see what the result will be. I anticipate that the prize offered by the Department of Agriculture a couple of years ago, for a cow producing 1,000 lb. of butter in a year, will be claimed this season, as it only requires good health for either of the two cows mentioned, to top the 1,000 lb. mark.

Mr. Pritchard's Ayrshire herd has put up a couple of excellent performances in both milk and butter. Ayrshire breeders are indebted to Mr. Pritchard for the way in which his herd is carrying the Ayrshire flag.

Mr. Jas. Pritchard's Ayrshire Herd, at Numba, Shoalhaven River.

Name of Cow.	Age at beginning of test.		Date of last Calving.	Total.			Yield on last day of test.	
				Milk.	Butter.	Average test.	Milk.	Butter.
	yr.	mth.	1916.	lb.	lb.	%	lb.	lb.
Miss Lucy of Kabibinokka	5	5	3 Sept ..	11,125	553	4·2	21·	1·15
Beeswing of ,,	5	7	20 Oct....	10,426	510	4·1	20·5	1·03
Mona ,, ,,	4	7	18 ,, ...	10,324	487	4 0	22·	·98
Bonnie Maggie of Numba	11	0	21 ,, ...	6,934	315	3·8	12·	·57

For the month of October the cows were fed on pasture only. In November and December, in addition to pasture, each cow received 4 lb. bran, 2 lb. linseed meal, and 5 lb. wheaten chaff. From January to July the cows were fed on pasture only.

Mr. J. T. Young's Milking Shorthorn Herd, at Bangalow.

Name of Cow.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916	lb.	lb.	%	lb.	lb.
Kitty	7	29 Sept...	7,905	373	4·0	13·5	·78
Spanker	5	23 Oct. ...	9,190	441	4·1	15·	·68
Doris	6	13 Sept..	8,851	415	4·0	15·	·71
Silkie	6	16 Oct. ...	7,522	372	4·2	11·	·51

The cows were fed on pasture only.

Mr. C. R. G. Macdonald's Jersey Herd, at Ingleburn.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yr. mth.	1916.	lb.	lb.	%	lb.	lb.
Brighton Coomassie II, vol. vi	1 10	24 Sept ..	6,754	429	5·4	21·5	1·43
Brighton Vanilla II, 3078...	5 3	31 Oct. ..	14,867	808	4·6	38·5	2·52

In addition to pasture, each cow received daily 2 lb. each of bran, pollard, linseed meal and maizemeal, and 4 lb. lucerne chaff.

The Scottish Australian Investment Company's Milking Shorthorn Herd, at Darbalara.

Name of Cow and Herd-book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yr. mth.	1916.	lb.	lb.	%	lb.	lb.
Champion IV, 1314 ...	8 0	1 Oct. ..	6,858	347	4·2	4	·24
Poddy II, vol. iv	10 0	6 ,, ..	8,557	428	4·2	16	·82
Madame X, vol. iv ...	1 10	27 Sept...	8,172	378	3·9	17·5	1·10
Maggie IV, vol. iv ...	3 0	20 ,, ...	5,676	266	3·9	8	·47
Melba VII, vol. iv ...	6 0	25 Nov....	14,371	836	4·9	34·5	2·35

The cows Champion IV, Poddy II, and Maggie IV, were fed on pasture only. Melba VII, in addition to pasture, received during November, 1916, 8 lb. bran and 8 lb. oaten chaff daily; from December, 1916, to February, 1917, 10 lb. crushed oats, 8 lb. bran and green corn, daily; in March and April, 5 lb. bran, 5 lb. crushed oats, 3 lb. boiled corn, and 3 lb. oaten chaff, daily; in May, June and July, 3 lb. pollard, 8 lb. lucerne chaff, 4 lb. bran, and 4 lb. crushed oats daily. Madame X, in addition to pasture, received daily from November, 1916, to February, 1917, 1 lb. crushed oats, 1 lb. chaff, and 2½ lb. bran; from March to June, 3 lb. bran, 3 lb. chaff, and green corn daily.

Mr. J. R. C. Davies' Jersey Herd at Puen Buen, Scone.

Name of Cow and Herd Book No.	Age at beginning of test.	Date of last Calving.	Total.			Yield on last day of test.	
			Milk.	Butter.	Average test.	Milk.	Butter.
	yrs.	1916.	lb.	lb.	%	lb.	lb.
Puen Buen Velvet Fox, 3247	3	19 Mar ...	5,077	286	4·8	16·5	1·09
Vixen	4	10 June...	5,517	336	5·2	13·5	·90
Captor's Coral, 3243 ...	3	29 Mar ...	4,224	255	5·1	15	·92
Maitland Lady	4	17 May ...	4,653	321	5·8	10·5	·79
Puen Buen Molly IV ...	4	8 June...	5,730	307	4·5	15	·99

In addition to pasture, each cow received daily, from June to November, 1916, 15 lb. maize ensilage and 6 lb. bran; and from December, 1916, to February, 1917, pasture only.

PURE SEED MAIZE.

THE Department of Agriculture has a limited amount of pure *selected* seed maize for sale for the coming season, both for grain and fodder purposes, as follows:—

Variety.	Seed available at	Railway Station or Wharf.
Improved Yellow Dent *Leaming	Grafton Experiment Farm	Grafton.
Red Hogan	Hawkesbury Agricultural College ...	Richmond.
Boone County White... ...	Berry Experiment Farm	Berry.
Early Yellow Dent	Glen Innes Farm	Glen Innes.
Silvermine	Yanco Experiment Farm	Yanco.
Hickory King	Emu Plains Irrigation Farm	Emu Plains.
Funk's Yellow Dent	North Bangaroo Stud Farm	Canowindra.
Reid's Yellow Dent ... Gold Standard Leaming	Department of Agriculture	Sydney.

* No seed of this variety can be supplied after the middle of October.

The price is 7s. 6d. per bushel f.o.r. or f.o.b. at the station or wharf mentioned. Bags 9d. each extra.

As the supply is limited, intending purchasers are recommended to apply at once direct to the respective Experiment Farms or to the Department of Agriculture, Sydney, but inquiry should be made to ascertain whether the required quantity is in stock before remittance is sent.

All orders should be accompanied by remittance, with exchange added for cheques.

Blossoming Dates of Apples and Pears.

RECORDED AT BATHURST EXPERIMENT FARM.

G. H. JOHNSTON, Housemaster.

THE importance of cross-pollination as a factor in fruit-production is now generally accepted, and the planting of a single variety, at any rate of apples and pears, in solid blocks should now be a thing of the past, it being recognised that such a practice means failure.

The more up-to-date method of planning an orchard is to arrange the varieties in double rows, side by side with other varieties which blossom as nearly as possible at the same time. If a larger number of one variety is required than of the pollinating variety, the former may be planted in four rows, alternating with two rows of the pollinating variety. The system of planting two or four rows of a variety should be adhered to, as being more economical and handy for spraying and picking.

An alternative method, where the grower wishes to plant a great preponderance of a single variety, is to plant as the pollinating variety the fourth tree in each alternate row, in such a way that the pollinating tree in one row is not exactly opposite to that in the alternate one. This can be done by planting the pollinating variety first, fifth, ninth, &c., in the second row, and third, seventh, eleventh, &c., in the fourth row—the first and third rows being of the main variety only. This should be repeated throughout the planting, and will give about seven of the main variety to one of the pollinating sort.

The accompanying list of order of blossoming has been prepared for the benefit of intending planters. It is based on the observations made at this farm for many years past, and especially on those of the past three years. The actual date of blossoming may be later or earlier according to the season, but each variety adheres pretty closely to its relative position. The earliest blossomer among the apples in this orchard is King of Pippins (Golden Reinette), and the date on which this variety commences to bloom is taken as the first day of the blossoming season for apples. Another which begins four days after is said to start on the fifth day, and a sequence of blossoming has thus been worked out. A similar procedure is adopted with pears—Kieffer being the first to bloom.

In the subjoined list, the varieties are divided into groups according to their blossoming season. This is somewhat arbitrary, and there may be overlapping from one group to another, but the figures give the commencing day, as explained above, and show the varieties which may be expected to blossom on or about the same day.

The average duration of flowering was, in the case of apples, 9¾ days, and pears, 10¼ days. There is thus a good deal of latitude in the selection of pollinating varieties, but, as the first flowers appear to set the best fruit, it is as well to use as a pollinator a variety which blooms exactly with, or slightly before, the main variety.

Order in which Apples Blossom.

Very Early.—(1) King of Pippins (Golden Reinette).
(4) Blondin.

Early.—(5) Isham Sweet, Lord Nelson.
(6) Gravenstein, Late Wine, Roxbury Russet.
(7) Ben Davis, Black Ben Davis, Cleopatra, Jewel, Kentucky Red Streak, McIntosh Red, New Water, Prince Bismarck.
(8) Belle de Boskoop, Dunn's Favourite, Gooseberry, Granny Smith, King of Tompkin's County, Magg's Seedling, Ribston Pippin, Scarlet Nonpareil, Striped Winter, Sharp's Early.

Midseason.—(9) Glowing Coal, Margil, Oakland, Pioneer, Pomme de Neige (Fameuse), Statesman, Stanard, White Winter.
(10) Clayton, Crofton, Champion, Duke of Clarence, Gano, Irish Peach, Jonathan, Ma Pippin, Rhode Island Greening, Rymer, Stone Pippin, Twenty Ounce.
(11) American Golden Russet, Esopus Spitzenberg, Excelsior, Fall Pippin, Keswick Codlin, Melon, Lehigh Greening, Munson, Nick-a-jack, Peasgood Nonsuch, Salome. Scarlet Pearmain, Sturmer, Stayman, Wagener, Wealthy, Yates.
(12) American Summer Pearmain, Awasinoe, Delicious, Devonshire Quarrenden, Dutch Mignonne, Ewalt, Hoary Morning, Huon Pearmain, Ohio Nonpareil, Pumpkin Russet, Rokewood, Saltram, Shockley, Willow Twig.

Late.—(13) Hollandbury, John Sharp, Judson, King David, Rival, White Pippin, Winesap.
(14) Coffelt Beauty, Emperor Alexander, Gence, Jacob, Milden, Newtown Pippin, Wolf River.
(15) Blenheim Orange, Foster, Hoover, Rawson Late, Titus Pippin, Thompson, Winter Strawberry.
(16) Aromatic Carolina, Beauty of Kent, Buncombe, Cox's Orange Pippin, French Crab, Lane's Prince Alfred, Tomber Mogden, Williams' Favourite.

Very Late.—(17) Late Prolific, Reinette de Canada.
(18) Bertha, Northern Spy.
(19) London Pippin, Worcester Pearmain.
(20) Annie Elizabeth, Rome Beauty.

Alphabetical List of Apples in Sequence of Blossoming.

(The figures in brackets refer to the corresponding days in the previous table.)

American Golden Russet (11)
American Summer Pearmain (12)
Annie Elizabeth (20)
Aromatic Carolina (16)
Awasinoe (12)

Beauty of Kent (16)
Belle de Boskoop (8)
Ben Davis (7)
Bertha (18)
Black Ben Davis (7)
Blenheim Orange (15)
Blondin (4)
Buncombe (16)

Champion (10)
Clayton (10)
Cleopatra (7)
Coffelt Beauty (14)
Cox Orange Pippin (16)
Crofton (10)

Delicious (12)
Devonshire Quarrenden (12)
Duke of Clarence (10)
Dunn's Favorite (8)
Dutch Mignonne (12)

Emperor Alexander (14)
Esopus Spitzenberg (11)
Ewalt (12)
Excelsior (11)

Fall Pippin (11)
Fameuse (9)
Foster (15)
French Crab (16)

Gano (10)
Genee (14)
Glowing Coal (9)
Golden Reinette (see King of Pippins)
Gooseberry (8)
Granny Smith (8)
Gravenstein (6)

Hoary Morning (12)
Hollandbury (13)
Hoover (15)
Huon Pearmain (12)

Irish Peach (10)
Isham Sweet (5)

Jacob (14)
Jewel (7)
John Sharp (13)
Jonathan (10)
Judson (13)

Kentucky Red Streak (7)
Keswick Codlin (11)
King David (13)
King of Pippins (1)
King of Tompkins County (8)

Lane Prince Alfred (16)
Late Prolific (17)
Late Wine (6)
Lehigh Greening (11)
London Pippin (19)
Lord Nelson (5)

Ma Pippin (10)
Maggs Seedling (8)
Margil (9)
McIntosh Red (7)
Melon (11)
Milden (14)
Munson (11)

Newtown Pippin (14)
New Water (7)
Nick-a-jack (11)
Northern Spy (18)

Oakland (9)
Ohio Nonpareil (12)

Peasgood Nonsuch (11)
Pioneer (9)
Pomme de Neige (see Fameuse)
Prince Bismarck (7)
Pumpkin Russet (12)

Rawson Late (15)
Reinette du Canada (17)
Rhode Island Greening (10)
Ribston Pippin (8)
Rival (13)
Rokewood (12)
Rome Beauty (20)
Roxbury Russet (6)
Rymer (10)

Salome (11)
Saltram (12)
Scarlet Nonpareil (8)
Scarlet Pearmain (11)
Sharp's Early (8)
Shockley (12)
Stanard (9)
Statesman (9)
Stayman (11)
Stone Pippin (10)
Striped Winter (8)
Sturmer (11)

Thompson (15)
Titus Pippin (15)
Tomber Mogden (16)
Twenty Ounce (10)

Wagener (11)
Wealthy (11)
White Pippin (13)
White Winter (9)
William's Favorite (16)
Willow Twig (12)
Winesap (13)
Winter Strawberry (15)
Wolf River (14)
Worcester Pearmain (19)

Yates (11)

Order in which Pears Blossom.

Very Early.—(1) Kieffer.

(2) Le Conte.

(4) Chaumontelle, Forelle.

Early.—(5) Jargonelle, Howell, Beurre d'Anjou.

(6) Monchallard, Bergamot d'Esperen, Beurre Clairgeau, Colonel Wilder.

(7) P. Barry, St. Crespin, Baronne de Mello.

(8) Andre Desportes, Elizabeth Cole, Packham's Triumph, Beurre Superfin, Calabasse Cole, Gansell's Bergamot, Rostiezer.

Midseason.—(9) B. S. Fox, Doyenne de Richard, Washington, Backhouse Bergamot, Beurre Gris d'Hiver Nouveau, Zoe, Lawrence, Broompark, Délices d'Hardenpont, Flemish Beauty, Hoosic, Onondaga.

(10) Louise Bonne de Jersey, Mme. Henri Desportes, Beurre d'Amanlis, Charles Cognac, Flemish Rose. Isse Bourne, Marie Louise d'Uccle, Sheldon, Thérèse Appert, Knight's Monarch, Lawson, Seckel, Williams, Conference.

(11) Souvenir du Congress, Vicar of Winkfield, Idaho, Easter Beurre, Columbia, Winter Nelis, Althorpe Crasanne.

(12) White Doyenne, Anna Nelis, Clapp's Favourite, Doctor Reeder, Thompson, Doyenne Boussoch, Beurre Capiaumont, Winter Bartlett, Desirée Cornelis.

Late.—(13) Doyenne du Comice, Fertility, Jean de Witte, Winter Cole, Madame Cole, L'Inconnue.

(14) Bailey's Bergamot, Autumn Beauty, Beurre Bosc, Spanish Bon Chrétien, Packham's Late.

(16) Marie Louise, Gregoire Bordillon.

Alphabetical List of Pears in Sequence of Blossoming.

(The figures in brackets refer to the corresponding days in the previous table.)

Althorpe Crasanne (11)
Andre Desportes (8)
Anna Nelis (12)
Autumn Beauty (14)

Backhouse Bergamot (9)
Bailey's Bergamot (14)
Baronne de Mello (7)
Bergamot d'Esperen (6)
Beurre Bosc (14)
Beurre Capiaumont (12)
Beurre Clairgeau (6)
Beurre d'Amanlis (10)
Beurre d'Anjou (5)
Beurre Gris d'Hiver Nouveau (9)
Beurre Superfin (8)
Broompark (9)
B. S. Fox (9)

Calabasse Cole (8)
Charles Cognac (10)
Chaumontelle (4)
Clapp's Favorite (12)
Colonel Wilder (6)
Columbia (11)
Conference (10)

Délices d'Hardenpont (9)
Desirée Cornelis (12)

Doctor Reeder (12)
Doyenne Boussoch (12)
Doyenne du Comice (13)
Doyenne de Richard (9)

Easter Beurre (11)
Elizabeth Cole (8)

Fertility (13)
Flemish Beauty (9)
Flemish Rose (10)
Forelle (4)

Gansell's Bergamot (8)
Grégoire Bordillon (16)

Hoosic (9)
Howell (5)

Idaho (11)
Isse Bourne (10)

Jargonelle (5)
Jean de Witte (13)

Kieffer (1)
Knight's Monarch (10)

Lawrence (9)
Lawson (10)
Le Conte (2)
L'Inconnue (13)
Louise Bonne de Jersey (10)

Madame Cole (13)
Madame Henri Desportes (10)
Marie Louise (16)
Marie Louise d'Uccle (10)
Monchallard (6)

Onondaga (9)

Packham's Late (14)
Packham's Triumph (8)
P. Barry (7)

Rostiezer (8)

St. Crespin (7)
Seckel (10)
Sheldon (10)
Souvenir du Congress (11)
Spanish Bon Chrétien (14)

Thérèse Appert (10)
Thompson (12)

Vicar of Winkfield (11)

Washington (9)
White Doyenne (12)
Williams (10)
Winter Bartlett (12)
Winter Cole (13)
Winter Nelis (11)

Zoe (9)

"Policemen Flies."

FOSSORIAL WASPS THAT CATCH FLIES.

W. W. FROGGATT, F.L.S., Government Entomologist.

THESE active little digging wasps have attracted a considerable amount of attention through their habit of hunting and capturing various kinds of pest flies belonging to the family *Muscidæ.* From this habit bushmen have christened them "Policemen Flies." Riding along the tracks out west in the summer time it is a common thing to see one of these little hunters swoop down and snap up a fly on the horse's shoulder, or even pick up one resting on the horseman's bare arm. About a camp where the small black bush flies (*Musca corvina*) are one of the greatest pests, these little wasps often appear in numbers to capture their prey. In the dining tent at the Government Sheep-fly Experiment Station on the Murrumbidgee River, in the early summer (October and November) they were particularly active. At the midday meal it was a common thing to see a dozen at a time running over the tablecloth among scores of bush flies, which did not seem to recognise their enemies. When about to jump the policeman fly (not much larger than his prey) flattened his body down, and, slightly spreading his wings, with one spring landed on the back of the doomed fly, seizing it behind the head with its powerful jaws, and evidently killing it in the act. Sometimes there was a slight struggle, but generally the wasp flew straight off to the river timber, carrying the fly in its legs. These captured flies were stored in holes excavated in the sand, I believe, though at this time we were unable to find any trace of their burrows.

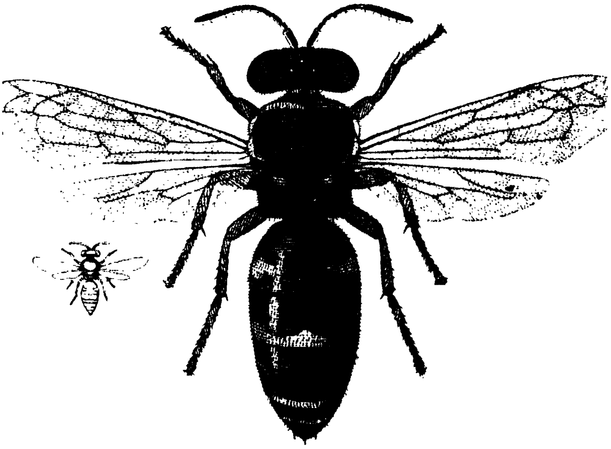
Though both the species noticed below confine their attention chiefly to the small black bush-fly, they have been frequently noticed, mostly in the sheep yards, flying on to sheep's backs and picking off the Small Green Hairy-maggot Fly, *Pycnosoma* (*Calliphora*) *varipes*, resting on the soiled wool. Other sheep-owners have stated that they have seen them capture the larger blow-flies, but the latter is not a common prey, and is much too large to carry when flying. Therefore, though when numerous they may be some slight factor in the destruction of the countless thousands of bush flies, it is very doubtful if they make much impression upon even the small green blow-flies.

There are probably a number of different species of these fossorial wasps that indulge in the fly-catching habit, but only the following three have been taken in the act.

The Variegated Policeman Fly (*Stizus turneri*, n.sp).

This is a small wasp with a wide head, stout thorax, clear wings, variegated legs, and cylindrical shining abdomen, lightly clothed with very fine hairs, and tapering at both extremities. Length, over ⅓ inch.

The head is black, the face yellow with a black spot in the centre, the whole covered with very fine hairs which, when viewed from above, give it a bright silvery sheen. The antennæ are yellow in front, but their hind surface is dark brown. The thorax is black with a narrow yellow band behind the head; spots at the base of the wings, forelegs, with two brighter spots and stripe on the back behind the base of the wings pale yellow. The legs are yellow and reddish yellow, with the thighs blotched with blackish brown; the wings clear, with dark brown veins. The abdomen is dark reddish-brown, variegated with yellow; on the first segment there is a large blotch on either side, but not extending right over the back. The second segment is encircled with a narrow band, followed by a darker chestnut-brown band, and on the third segment there is a similar yellow ring with the tip telescopic and covered with fine downy hairs. I found this species very plentiful, with several species of Bembex burrowing in a sand-drift left by the flood waters of the Murrumbidgee, near Hay, in February. This species is common all over the western districts of New South Wales. We have received it from a number of correspondents as a "policeman fly."



The Variegated Policeman Fly (*Stizus turneri* n.sp.).

I find it in my collection identified by Mr. Rowland E. Turner, of the British Museum, as a member of this genus without a specific name, and have named it accordingly.

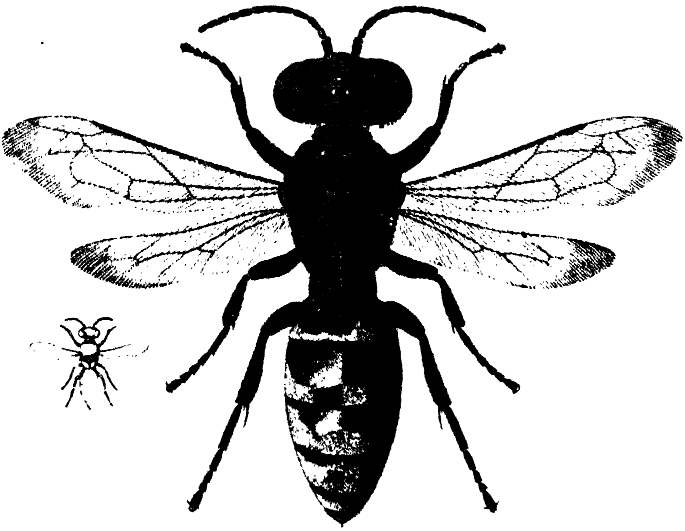
The Red-legged Policeman Fly (*Stizus* sp.).

This is also a widely distributed species that is common in the Brewarrina district, and all through the west down to the Riverina. It has been frequently recorded upon the fleece of the sheep catching flies, and it was also seen hunting small bush flies at the Sheep-fly Experiment Station. Length, over ½ inch.

General colour black, with the eyes, legs, bosses on the shoulders and hind margin of the mesothorax reddish brown. The front of the face is covered with a fine pale golden pubescence and downy hairs, the antennæ dark brown with reddish-yellow markings on the basal segments. The front of the prothorax behind the head forms a pale yellow band clouded with reddish brown, and curving out on the sides to the front of the insertion of the wings. The mesothorax is finely granulated, with the metathorax channelled down the centre, with a patch of silvery hairs on either side. The smooth, shining black abdomen is clothed with a rich silvery pubescence, giving it a bright metallic tint, the tip reddish brown.

The Golden-bodied Policeman Fly (*Nysson* sp.).

This is a larger wasp of a uniform black colour, but richly tinted with golden pubescence upon the abdomen. It has similar habits and ranges over similar country to the two previous species. Length, under ½ an inch.



The Golden-bodied Policeman Fly (*Nysson* sp.).

The face is clothed with silvery pubescence and downy hairs, that also cover the hind margin of the head and front of the prothorax, the latter with a distinct band of silvery pubescence. The downy, silvery hairs lightly clothe the greater part of the thorax, chest, metathorax and undersurface. The upper surface of the abdomen has a silver band on the first segment, and the following ones are richly barred and banded with golden pubescence, interspersed with shining black blotches. The wings are clear, the nervures black, with the outer margins slightly clouded on the forewings.

Solandra longiflora.

A NEW DRUG PLANT.

E. N. WARD, Superintendent, Botanic Gardens, Sydney.

Solandra longiflora (*S. lævis* Hook.) a native of the West Indies, is an evergreen shrub or climber. By constant pruning (which would be practised if the plant be grown for drug purposes) it can be grown as a dwarf shrub, but if left unpruned it will make a rampant climber. One plant growing at Rose Bay, at the foot of a Norfolk Island pine 100 feet high, has grown to the top of this tree and flowers profusely from its branches. The large trumpet-shaped, pale yellow flowers are beautiful, which makes the plant a desirable garden subject, apart from its economic value. It produces flowers from short growths, after it has been hard pruned into shrub form no higher than 4 feet. It is an accommodating plant, as it grows well in the driest and most hungry places, and does not appear to object to gross feeding. It makes an excellent hedge, but must not be planted where live stock can reach it, for it belongs to that most poisonous of plant families, *Solanaceæ*, and its tribe is *Atropeæ.*

The foliage of this plant produces a valuable drug, to which has been given the name "solandrine"; it has the same active principles as atropine, which is produced from the leaves and roots of *Atropa belladonna*, or "Deadly Nightshade." But *Atropa* is difficult to grow in this State; and it is a question whether, when it is grown, the leaves and roots when assayed for drug purposes will prove payable, for even in England, where the plant is largely grown, the uncultivated is preferable to the cultivated plant, whereas the *Solandra* will grow easily and quickly wherever West Indian plants will grow, which is almost anywhere, inland or coastal, where frost is not continuous and snow does not remain on the ground.

The best method of propagation is by cuttings, for these root freely. The cuttings should be taken at the end of May from flowering "wood" just after flowering is over. The wood is then not too soft and not too hard. The cuttings should be put in nursery rows, in light sandy soil, well drained, and when the ground where they are planted has begun to get warm in late spring they will be sufficiently rooted to plant out.

When this new drug solandrine becomes more widely known, there will be a substantial demand for solandra leaves, and it will be a pity if growers of drug plants in this State should be found still struggling with the cultivation difficulties, for belladonna leaves and root will be largely superseded by the more valuable and far more easily produced *Solandra* leaves.

For valuable researches on the active principles contained in the leaves of species of *Solandra*, see Dr. J. M. Petrie's paper in the *Proceedings of the Linnean Society of N.S.W.*, vol. xli, p. 815 (1916), and an earlier one, vol. xxxii, page 789 (1907).

Poultry Notes.

SEPTEMBER.

JAMES HADLINGTON, Poultry Expert.

THE end of this month, or at the very latest the first week of next, will bring to a close the profitable hatching season for this year. This means that it is inadvisable to set eggs after the middle of this month. The temptation to prolong the hatching season far beyond this period is well understood, particularly as eggs are usually hatching well, but for other reasons it is preferable to stop at this time.

Making due allowance for the very natural desire to have more chickens, the one factor that should be kept consistently in mind is "Will it pay to go on hatching?" The experienced poultryman has found that it will not; but others persist in trying, regardless of what is known to be practicable.

From many points of view continuous hatching would be desirable were it also profitable, but profit and not mere numbers should be the main consideration. If the stock fail to be remunerative, the uselessness of keeping them should be apparent.

Hatching Seasons.

The question is often asked whether June to October is the only hatching season. The answer to this is in the negative; but it is the most profitable one. In this regard it might be pointed out that it is much preferable to make another hatching season embracing February and March than to prolong the spring hatching beyond September. The pullets hatched out in these months are less prolific layers; but the high prices obtainable for good table poultry from May to November make a short hatching season in these months a more or less profitable proposition, and better development is obtained than from a continuation of hatching into October. October, November, and December are found to be the worst months of the year. The development of the chickens hatched during those months, except in small lots and under special conditions, is so poor as to make it unprofitable; and in addition, the chickens so hatched are most susceptible to disease.

Brooding with Hens.

Where sitting breeds are being kept broody hens will now be plentiful, and might be utilised to supplement the rearing capacity on many farms. It is a much better practice to divide a hundred chickens between six broody hens, and to rear them in that way, than to use a doubtful class of brooder or resort to overcrowding good ones. The practice works very well if the hens are confined to coops. Such coops can be made out of large tea chests with slats on the front, while the tops might be covered with a bit of roofing felt to make them waterproof. If small runs can be attached to the front of the coop it will be all the better; but this is not absolutely essential, as the hen will take no harm in the coop, and the chickens are allowed to run in and out.

All that is necessary to get the hens to take to the chickens when once she has become broody is to get her nicely settled to the nest and to set her on a couple of dummy eggs. If the hen is thoroughly broody, in two or three days she will be ready to take the chickens. But in manipulating chickens and hens in this way, the chickens should be taken direct from the incubator and placed under the hen, preferably at night, because if the chickens have been put into a brooder, or have in any way become accustomed to other arrangements and surroundings, or even to full light, they will rarely take to the hen. This is as bad as the hen not taking to the chickens as far as results are concerned.

A Troublesome Parasite.

During the last rearing season, say from August to November, the prevalence of suck-louse was responsible for considerable loss among chickens. This parasite infests the heads of very young chickens, even from a week old to a couple of months. The work of this parasite, like most others, is insidious, and is often quite unnoticed by the attendant until considerable loss has become inevitable. The trouble thus experienced is often attributed to some mysterious sickness.

It is a common belief among poultry-keepers who know this parasite, that its presence is confined to chickens brooded with hens, but this is not so, although the liability to it is much greater with chickens so brooded than is the case with chickens reared artificially; yet the idea underlying that belief is correct, because it is only by contact with hens that infestation takes place. But this contact is easily made when hens are run in close proximity to brooding arrangements; hence the insistence of the writer that, in laying out a poultry farm, the rearing equipment should be completely separated from adult quarters, not only as a safeguard against this parasite, but others.

The method of dealing with the suck-louse is simple, but unfortunately involves the handling of every chicken where infestation has become established. When chickens appear to be dull and peaky, with drooping wings, from no apparent cause, the presence of this parasite may be suspected, and a thorough examination of the head, throat, and neck should be made, particularly the top of the head. If the infestation is in the early stages, probably nothing but what appears to be a mass of nits will be found, but the more mature insects, which rarely exceed a sixteenth of an inch in length, and somewhat narrow, are of a dark grey colour, and may be mistaken for the sheaths and "buds" of small feathers. They are not easily detected, but a ready way of showing them up is to moisten a piece of flannel very slightly with kerosene and hold it on the head of one of the chickens for a second or two, when the lice will withdraw and show themselves. If one chicken in a lot is found to be infested, it may safely be assumed that all are more or less so. To destroy this parasite, all that is necessary is a little salad oil applied to the head and throat of the chicken, but this should be done as lightly as possible, because if oil or grease of any kind is applied heavily to the down on chickens it is calculated to cause more deaths than the parasite. It will probably be necessary to repeat the application in eight or ten days' time.

Green Feed.

Where lucerne is not available, or cannot be grown, a provision for a plentiful supply of other green food should now be made before the hot weather sets in. The most suitable crops to sow for this purpose during the next two months are maize, Hungarian millet, and cowpea. These, of course, will require to be chaffed up and fed in that state. Other crops, such as Silver Beet, might be grown where there is good soil and a plentiful supply of water.

Dealing with Vermin in Poultry Houses.

A sharp look-out should now be kept for all kinds of vermin in the poultry-house and on the bodies of the fowls themselves. Poultry parasites may be divided into two groups: (1) Those that live and hibernate in the poultry-house on roofs, &c., of which the red mite (*Dermanyssus gallinæ*) is an example; and (2) those that pass their whole existence on the fowl, of which the large chicken louse (*Goniocotes abdominalis*) is one.

To combat the first class, we must spray or otherwise attack them in the house and on the roosts, whence they emerge at night to prey upon the fowls, which are practically free from infestation during the day, except for those that may be rubbed off the nests, perches, or walls where the insects are numerous, or those that attack sitting hens.

Quite a different method must be adopted in the case of the other species. These can only be combated by the dust-bath, or by dusting the birds by hand with insecticides, or sulphur, or equal parts of sulphur and fine ashes.

The best method of keeping or getting poultry-houses clear of vermin is to spray them with kerosene emulsion as frequently as may be necessary.

To make the emulsion take 8 oz. of soft soap and dissolve it in 1 gallon of boiling water; take the mixture off the fire and add slowly 1 gallon of kerosene, stirring all the time. This mixture should be agitated briskly until the oil and the soapy water are thoroughly emulsified. These 2 gallons are then designated the "stock." Add to this 10 gallons of soft water. Hard water will not do, nor should lime or any caustic substance come in contact with it, or the result will be that the oil will separate from the soapy water, and the emulsion be spoiled.

If it be desired to make the spray also a disinfectant, add one tablespoonful of miscible carbolic acid to each gallon of emulsion. The whole should be kept well stirred, especially when adding water.

A spray pump and hose, similar to those used by orchardists, should be used to force the emulsion into all cracks and crevices about the poultry-houses. A small force pump suitable for this work is obtainable, which can be placed in a kerosene tin and held down by means of a foot-rest that is provided. The whole, with a short length of hose and nozzle complete, is obtainable at from 19s. 6d. to 22s. 6d. in Sydney.

In cases where the infestation is bad one spraying is not sufficient—two or three may be necessary, at intervals of a day or two between each.

Should the vermin be confined to the roosts, these might be washed over with a brush in place of spraying.

The above treatment is also effective in the case of poultry-houses infested with fowl-tick.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

The first meeting of this branch was held on 23rd July, when Mr. H. Wenholz, B.Sc. (Agr.), Inspector of Agriculture, opened the branch by delivering a lecture on manures and manuring, with special reference to vegetables. There were about sixty persons present.

Ten new members were enrolled at the meeting.

A meeting was held on 30th July, when Mr. E. Ward, Superintendent of the Botanic Gardens, Sydney, gave a lecture on floriculture, touching also on vegetable growing. He replied to a considerable number of questions at the conclusion of a useful address.

Braidwood.

A meeting was held on 26th July. After the general business had been dispensed with, a discussion took place on the breed of sheep most suitable for the district.

Buckaroo.

A branch of the Bureau has been formed at Buckaroo, with a substantial membership. The officers are: Chairman, Mr. J. D. Mason; Vice-Chairman, Mr. A. Huxley; Treasurer, Mr. S. Elphinstone; Hon. Secretary, Mr. P. J. Crowley.

Coobang.

The annual meeting was held on 2nd July, and the election of officers resulted as follows:—Chairman, Mr. W. Annison; Vice-Chairman, Mr. A. Symonds; Treasurer, Mr. J. T. Symonds; Hon. Secretary, Mr. H. E. Drabsch.

Mr. A. SYMONDS, a new member, read a paper on wheat growing, recalling in an interesting manner the beginnings of the wheat industry in South Australia, and its gradual development, until, with the aid of fertilisers and fallowing, eight or ten bags are now grown where, years ago, he grew only the same number of bushels. He concluded with general observations, the result of a long experience.

Coraki.

The Secretary's annual report for this branch showed that eleven meetings had been held during the year, and that the membership roll stood at thirty-one. Many instructive discussions had taken place during the year, and some valuable lectures had been given. The most distinctive achievement of the branch was the exhibit of produce made at the local show; notwithstanding an adverse season for farm products, the exhibit had been generally admired and commended. Sets of books on agricultural subjects from the Public Library, Sydney, were arriving, and were bound to prove helpful.

Cordeaux-Goondarin.

A meeting of this branch was held on 4th July, at Mr. H. Filby's residence, when a paper on the indigenous timbers of the district, their properties and uses, was read by Mr. R. J. Fishlock. The meeting afterwards discussed the practical use of timber for building and fencing, and the varieties most suitable for making fruit cases. The abundance of the last in the district is expected to lead to important developments in the future.

The members were hospitably entertained by Mr. and Mrs. Filby, a vote of thanks being afterwards accorded them by acclamation.

The annual meeting of the branch was held at Mr. Fishlock's residence on 1st August.

The Secretary's report showed that the membership for the year just closed was thirty-one, that the attendance of members had been good, and that the papers read and discussed during the year were instructive and beneficial.

The appreciation of the services to the branch of Mr. F. A. March, who formerly acted as Hon. Secretary, and who now has gone to "the front," was testified by members and placed upon the records.

The following officers were elected for the ensuing year:—Chairman, Mr. J. W. Cram; Vice-Chairmen, Messrs. H. Cowain and W. Woodyatt; Treasurer, Mr. R. J. Fishlock; Hon. Secretary, Mr. G. H. Walker.

At the conclusion of the meeting the members were regaled with refreshments by Mr. and Mrs. R. J. Fishlock, who were accorded a hearty vote of thanks.

French's Forest.

A meeting was held on 28th July. Members considered that their experiment in the co-operative purchase of manure had been very successful, and it was decided to further co-operate in obtaining general produce.

A lecture was given by the Poultry Expert of the Department on 30th July.

Glenorie.

A meeting was held on 30th June, when a discussion took place as to methods that could be adopted to increase the membership during the ensuing twelve months.

Holbrook.

Mr. W. le Gay Brereton, Assistant Fruit Expert, gave a pruning demonstration at Mr. Smith's orchard, Holbrook, on 11th July. The Secretary reports that there were seventy persons present, who were unanimous in their appreciation of the instruction given.

Inverell.

The subject of the Bathurst Burr continues to interest the members of this branch, and a movement is being made in the direction of some concerted action for the destruction of the pest.

Mr. G. H. Arkinstall brought the matter before the branch again at the last meeting by reading some notes in the following strain :—

In bringing this question before the Inverell branch of the Agricultural Bureau, I entertain the hope that other branches and kindred societies will take the question up, with the object of holding a conference of practical men from different parts of the Commonwealth to formulate a scheme for the eradication of this, our most widely distributed and worst weed pest. It is a big question, and one that must be dealt with in a drastic way. It may be asked : "Is it worth while?" To answer that question, one has only to consider the amount of damage done to the wool clip by the burr getting into the wool. The loss alone on this one item runs into thousands of pounds annually. Then there is the nutriment taken out of the soil that ought to go towards producing crops of value. The readiness with which the seed can be carried by stock, more especially by sheep, makes it a very difficult matter to control the spread of seed. In cultivation paddocks the burr could be practically wiped out in a few years by fallowing the paddocks and ploughing the plants under before they have had time to go to seed. It is when we come to the grazing lands, roads and stock routes that the real trouble begins—more especially on river and creek banks and beds. The burr seed does not readily sprout; if left on the surface of the land it will lie there for years, the tough fibrous coating of the seed protecting the germ until in some way the seed is covered with earth. Under these circumstances it will take years of careful work to rid uncultivated land of the pest. Providentially, the burr does not lend itself to poor soil or bush lands; it prefers open land, and the richer the better. There are many farmers and graziers doing their best to control the burr on the lands they occupy, but of what avail is that if their neighbours do nothing? The greatest means of spreading the burr are undoubtedly watercourses and travelling stock routes. On the former, the seed is carried along by the flood waters and distributed on all the low-lying lands that it covers; on the latter the stock travelling or depasturing on them pick up and carry the seed.

The scheme of control, whether subsidy by the Government, reduced taxes on clean holdings previously infested, or what not, can best be formulated by a conference of practical men.

DISCUSSION.—The seriousness of the question was recognised, and all were agreed that concerted action alone would be effective.

Mr. SOMMERLAD explained the position in which the Pastures Protection Boards were placed, and expressed the opinion that the Pastures Protection Boards would presently be very likely to get the long-desired extension of powers, which would enable them to spend money on keeping the reserves and routes clean.

It was agreed to circularise all other branches of the Bureau, asking them to give serious consideration to the burr problem at some meeting within the next three months, and to forward a short summary of their views to the Inverell branch. From the opinions thus offered it is hoped that some useful suggestions will be forthcoming.

Kellyville.

A meeting was held on 4th August, when a discussion took place as to the advisability of co-operating with the Spencer branch in seeking an import duty on foreign fruits. The opinion of the meeting was favourable to the duty.

Lidcombe.

A meeting was held on 16th July, which was attended by sixty-three members and visitors. Miss E. M. Brace gave an address on vegetable growing, dealing with intense cultivation and the system of co-operation.

Middle Dural.

Owing to Mr. W. J. Baker's illness, the paper which he was to have read on poultry farming at the meeting on 27th July, had to be postponed. The proceedings took the form of a discussion on manures and manuring. The Secretary reports that the discussion was very interesting and instructive, the Chairman, Mr. C. W. Roughley, giving an informative report of the various manures he had used, and their actions on different soils.

Miller's Forest.

At the July meeting of this branch, Mr. J. Perrett presented a statement of the results of the maize experiments conducted on his farm under the direction of the Inspector of Agriculture for the district.

Of the varieties, Red Hogan stood alone, yielding over 105 bushels per acre. Leaming and Yellow Dent did well, but Hickory King was much less successful. It was also stated that the Department intended planting potato plots on Mr. Perrett's farm this spring.

Mr. M. R. Markham read a paper on dairying, for which he was accorded the thanks of the meeting.

Miranda.

This branch is trying for its coming year a new method of organization. It is dividing the work into sections. Three sections have been commenced, dealing respectively with poultry, orchard and garden, and women's work. The committee has been increased to nine—each section appointing three. Three Vice-Chairmen have also been elected—one for each section. As the branch has a large membership, it is hoped that the division will result in a considerable increase in the amount and effectiveness of the work done.

The election of officers at the annual meeting on 23rd July resulted as follows:—Chairman, Mr. E. Thacker; Vice-Chairmen, Messrs. E. E. Paine and E. W. Phillips and Mrs. W. H. Paine; Treasurer, Mr. R. E. Howcroft; Hon. Secretary, Mr. W. H. Paine; Auditors, Messrs. J. W. Macfarlane and F. A. Bourne.

Mittagong.

A meeting of this branch was held on 24th June, with Captain R. Fairley in the chair. Arrangements were made for the business of several meetings in the ensuing months.

A demonstration in pruning was given by Mr. le Gay Brereton, Assistant Fruit Expert, and was much appreciated by the members and visitors who attended.

Orchard Hills.

The annual meeting was held on 2nd July, when the Chairman, Mr. Dickson, read a paper in which several agricultural matters of local interest were dealt with, and a general discussion subsequently took place on the problems raised.

One new member was added to the roll.

The monthly meeting was held on 30th July. Mr. E. Basedow read an article from the *Agricultural Gazette*, which was discussed by members.

Quaker's Hill.

A branch has been formed at Quaker's Hill, twenty-six members having already joined. The following officers have been elected:—Chairman, Mr. Michael Mason; Vice-Chairman, Mr. Albert J. Tanner; Treasurer, Mr. Alfred Adams; Hon. Secretary, Mr. Cyril Gardner.

Penrose-Kareela.

A meeting was held on 12th July. After the usual business had been transacted, a discussion took place on orchard work. Several matters of interest arising out of the pruning demonstration given by Mr. Brereton, Assistant Fruit Expert, on 3rd July, were profitably discussed by members.

Spencer.

A meeting was held on 14th July, at which Mr. P. A. Edwards read a paper advocating the imposition of import duty on foreign fruit. The paper led to considerable discussion, and the meeting decided to communicate with the Federal member for the district and with kindred bodies, with a view to bringing the matter under the notice of the authorities.

A meeting of the branch also took place on 11th August, when Mr. E. C. Allen read a paper on blight-proof apple stock, in which he remarked on the prevalence of woolly aphis notwithstanding the use of blight-proof stock. He suggested that this was attributable to the stock being cut too short, and the union of stock and scion therefore came so close to the ground as to allow the scion itself presently to take root. He suggested that nurserymen should make it a practice to work the stock at least a foot from ground level.

Springside.

A meeting was held on 31st July, and was attended by twenty-six members.

Mr. T. C. Bowen read a paper on leguminous plants and their effects in increasing the nitrogenous compounds of the soil. Mr. Bowen outlined the requirements of plants, emphasising the importance of nitrogen and its costliness, and advocating the growing of legumes because of the service they render in transforming the nitrogen of the atmosphere into various compounds in the soil of which plants can make use.

St. John's Park.

A meeting was held on 20th July, when a discussion took place on the advisability of placing an import duty on citrus fruits.

The Chairman, Mr. F. Gara, gave a description of the method of grafting and pruning grape vines.

Tallawang.

A meeting was held on 7th July, at which Mr. H. H. Graham was elected Chairman for the ensuing year, and Mr. S. E. Hinder, Hon. Secretary and Treasurer.

Mr. S. E. Hinder read a paper on the loading of grain at Sydney under the bulk handling system.

Tallong.

A meeting was held on 4th August, at which Mr. Mills, Fruit Pests Inspector, read a paper on lime-sulphur spraying.

Thyra-Bunaloo.

A meeting was held on 28th July, at which Mr. J. Sinclair read a paper entitled "The Best Breed of Farmer's Sheep." The following is a précis of the paper:—

THE BEST BREED OF FARMERS' SHEEP.

In considering this question, the first thing to take into account is the class of country and the climatic conditions. In this district, which is subject to periods of drought, it is advisable to keep to a class of sheep that combines both wool and mutton, for if one breeds for mutton only and a dry time comes along to prevent the sheep being fitted for the fat market, there is little chance of getting anything for the wool. Therefore, we must keep off the black-faced varieties of sheep, and go for the better wool producers.

The Merino is not suitable for this barley grass country, unless one has clean plains to run his sheep on when the grass seed is falling. If one has such plain country, nothing pays better than the big bold type of Merino. The crossbred, however, suits this barley grass country very well, and the question is, which is the most profitable cross?

The Lincoln cross seems to be the most popular at present, for the reason that he is is the heaviest wool getter. But as the wool of this cross is rather coarse in quality the loss in price counteracts the weight to a great extent. An important consideration in any animal is constitution, and in this direction the Lincoln, with his small frame, flat ribs, and narrow chest, cannot be considered good. The coarse head and thick shoulders also cause considerable trouble at lambing time, when the Lincoln ram has been mated with Merino ewes, particularly with old ewes that have previously been bred to Merino rams.

The Leicester crosses, I think, are more profitable than the Lincoln, being inferior only in regard to weight of wool. When we consider that Leicester wool is worth from 10 per cent. to 20 per cent. more than Lincoln, this often more than makes up for the deficiency in weight. The Leicester has also a fine frame and a good constitution. The Border Leicester is particularly good in this respect, and I consider him the king of all long-wool breeds; even if he is bare about the points I do not call that a fault where we have grass seed to contend with during the late spring and early summer. For fat lamb raising the Border Leicester is one of the best, owing to its being a quick maturer, and there is seldom any trouble with ewes being unable to lamb.

Farmers as a rule are not particular enough about keeping good stock, and the most economical way of getting good sheep is to keep the best of the ewe lambs each year, instead of sending them off indiscriminately to the fat market. Nothing but first class rams should be used in breeding from ewes so chosen.

Woonona.

A pruning demonstration was given on 28th July by Mr. G. A. Jones, Inspector under the Vine and Vegetation Diseases and Fruit Pests Act.

The Secretary reports that there was a large attendance, and that fruitgrowers expressed much appreciation of the instruction offered.

Yarramalong.

A meeting was held on 31st July, twenty-five members being present. Mr. H. Wenholz, B.Sc. (Agr.), Inspector of Agriculture, delivered an address on the selection of seed maize. He urged that farmers should go through the field and make their first selection there. The trouble involved was slight compared with the improvement that could be effected in a few years. Lantern slides were freely used to enforce the lecturer's various points.

Orchard Notes.

SEPTEMBER.

W. J. ALLEN.

Spraying.

IF the spring proves to be a wet one, it is advisable to give those stone fruit trees, which in the previous season were attacked by such fungous diseases as Peach-leaf Curl, Shot-hole, Rust, Freckles, Brown Rot, &c., and apple and pear trees in districts where they are liable to Black Spot, a second fungicide spraying when the blossom buds are showing pink, but while the petals are still folded tightly. Either Bordeaux mixture (6–4–50) or lime-sulphur (Departmental formula), diluted 1–28, should be used. If either Black or Woolly Aphis is showing, tobacco wash can be combined with the lime-sulphur.

The period in which certain spraying operations have to be carried out is often very short, so that an adequate spraying plant and facilities for carrying out the work rapidly are very important. Reliable motor pumps that will give a uniform high pressure and allow of the use of double nozzles have done much to increase the speed at which sprays can be applied; and as, generally speaking, the motor spray means a saving of one man, this man can be well employed preparing and carting the spray to the pump, thus decreasing the time it is idle while being filled up. Often the difficulty is to supply the pump fast enough to keep it working continuously, so that every means should be used for the rapid mixing of the spray, filling the supply cart, and transferring the spray mixture from the supply cart to the tank of the spray outfit. In the first place, an adequate water supply at a central mixing station is necessary. In large orchards it is advisable to have several mixing stations, for if the cartage is a long one, the tank of the spray outfit has to be of larger capacity, and that makes a heavier, more cumbersome, and more unstable load, often requiring an extra horse to haul it over the soft land of the orchard. These drawbacks are very noticeable on steep hillsides or amongst large spreading trees that do not leave much space for passing between them. On account of expense, it is often not practicable to have pipes of large capacity carrying the water to the required points, and filling direct from small pipes into the spray tanks would be a slow business. To overcome this difficulty, a cistern of larger capacity than the tank of the spray outfit should be placed on a stand at the mixing station, and connected with the water supply pipes with a ball-tap. The cistern will then be filling while a load of spray is being taken to the outfit. The cistern should be provided with a large outlet tap or cock, and a hose which will quickly fill the supply cart or the mixing casks. If the source of the water supply is high enough to permit it, the cistern should be so placed as to allow of water running from it direct into the mixing casks, which should also be placed on staging high enough to allow the contents to run from large outlet taps or cocks, by means of hose or spouting, into the supply cart. This will do away with bailing and lifting.

The tank of the supply cart should be of wood and of the same capacity as the spray outfit, and it should have a large outlet tap or cock which will discharge the contents quickly into the tank of the spray outfit. As many spray mixtures are severe on metals, all taps or cocks should have oil run through them occasionally, and after spraying is completed they should be thoroughly rinsed and oiled before being put away.

If lime-sulphur is prepared a short time before it is needed, it can be drawn off and diluted as required; there is then practically no delay in mixing at time of spraying.

Bordeaux Mixture.

Bordeaux mixture should only be mixed as it is used, and a good number of mixing casks are necessary to keep up a constant and large supply.

A stock solution of copper sulphate (bluestone) can be made in a large cask, of a strength, say, of 1 lb. to 1 gallon of water. This can be done by weighing out the desired quantity of copper sulphate, and suspending it in a piece of bag or hessian in the upper part of a measured quantity of water the day before spraying operations commence. When mixing, a gallon of this solution is used for every pound of copper sulphate required. A mark should be made at the level of the liquid after removing any of the stock solution, so that if evaporation occurs it can be compensated for by the addition of more water.

To mix Bordeaux mixture properly the quantity of copper sulphate solution is placed in one cask and correctly diluted with water. The milk of lime is placed in another cask. Both casks should be on a raised platform, so that their contents can run through their outlet taps or cocks into a third cask twice their size. The third cask should also be on a platform high enough to permit its contents to gravitate quickly through a large tap or cock into the supply cart. It is better to use the third cask as described, rather than to mix direct into the supply cart, as the mixture can then be strained as it runs from the third cask. When large quantities are being dealt with, one man can be mixing while another is carting out. The size of the mixing casks is governed by the size of the tank of the spray outfit. For instance, if the tank's capacity is 100 gallons, two 50-gallon casks and one 100-gallon cask could be used. But as 100-gallon casks are often not obtainable ready made, four 25-gallon casks and two 50-gallon ones will serve the purpose. To accelerate the supply, the number of sets of casks is increased. The smaller casks should have the 25-gallon level accurately and plainly marked in two places on opposite sides of the interior; a countersunk hole or a short nail driven part of the way home answers the purpose. Larger casks should have the 50-gallon level marked in a similar way.

Tobacco Wash.

For making large quantities, 200-gallon cauldrons are convenient. A square 200-gallon tank with the top cut out will serve the purpose, but will not last long, and the cast-iron cauldron is the cheaper in the long run. Fuel is saved if they are properly set in brick, but as a make-shift they can be set over a trench lined with stones. Weigh in sufficient tobacco stalks (mid-ribs) to make 400 gallons of the wash, which will be approximately 134 lb. when using a formula of 1 lb. stalks to 3 gallons water. If washing soda is to be used add 4 lb. Place over the tobacco boards cut to fit inside the cauldron and cleated together, and weight them down with large stones. Fill the receptacle with water to within a few inches of the top, but so that it will not overflow when heated. Place a cover over the cauldron to check evaporation and loss of heat. Make sufficient fire under the cauldron to just about bring it to the boil, but do not let it continue to boil. Before using, allow the mixture to steep for at least eighteen hours from the time of lighting the fire. The stalks are thrown out on a sheet of iron so placed that any drainings from them will run back into the cauldron.

The mixture is divided according to the capacity of the tank of the spray outfit, *i.e.*, for a tank with a capacity of 100 gallons, take one-quarter of the mixture and make up to 100 gallons with water. If soap is to be used, 16 lb. of it dissolved in water can be added before the whole is made up to the 100 gallons. Soap is sometimes found to give trouble by curdling and preventing the valves of the spray pump from closing. Owing to the evaporation varying during the making, the amount of liquor will vary at completion. The contents of the cauldron can be divided up by measuring with a batten previously marked into gallons, or by adding water to bring the whole up to the 200-gallon mark, after the stalks are thrown out.

Three 200-gallon cauldrons used in the above way were found adequate to keep a supply of 800 to 900 gallons of spray per day.

The liquor should be strained through a double strainer, as it is run into the tank of the supply cart or spray outfit. The wash is improved in killing power if it is allowed to ferment by standing several days after the stalks are removed, but in time it becomes too objectionable to use. If only a limited quantity is required it can be prepared by allowing the stalks to steep in water for several days without applying any heat.

Codlin Moth.

A few of the earliest blossoming apples and pears may be ready this month to receive the first application of lead arsenate. It should be given when the petals have fallen, but before the calyx has closed. The bulk of the trees, however, will not be fit to spray till early next month.

Where possible, packing houses should be sealed up to prevent any codlin moths from escaping that may emerge from pupæ sheltering there. These moths can be killed each morning, as they are found about the windows, to which they are attracted by the light.

Treatment of Grape Vines.

As Black Spot of vines was so prevalent last season, the swabbing as late as possible before the buds burst should be followed by a spraying with Bordeaux mixture (6–4–50) after the buds burst and before blossoming. The first sulphuring for oidium of the grape vine should be done soon after the buds burst.

Ploughing and Cultivation.

Should ploughing have been delayed by wet weather or other causes, it should be put through at once.

The cultivator should be started if the weeds commence growing, or the ground is caking, as the future crop depends largely on the condition of the soil. Where a cover crop or heavy growth of weeds has been turned under, it will be necessary to use disc cultivators until the crops or weeds have rotted.

The soil around the trees or vines, which cannot be reached by the plough or cultivator, should be thoroughly worked, and all weeds destroyed with either a flat or pronged hoe.

Grafting and Budding.

Heading back of useless trees and grafting with more profitable varieties can be continued this month.

The budding of young nursery citrus stock or reworking of older citrus trees can be done now if the sap is running freely and the bark lifts easily. When operating on the latter it is well to put in plenty of buds, so that if some fail there will be sufficient left from which to start the new top. To ensure a well-formed tree, the buds should be inserted about where it is desired to have a new branch. After the buds have distinctly taken the branch may be cut back, after which the buds will soon make a growth and will then need to be tied to a stake to prevent them from being blown off.

In the Citrus Orchard.

The planting of citrus trees should be completed so that they may become established before hot, dry weather sets in. The ground should have been previously deeply worked, and should be in a friable, moist condition.

It is a good time to give citrus trees their annual thinning out, removing spent, dying, and dead shoots throughout the body of the tree.

It is usually advantageous in irrigated orchards to give citrus trees a good soaking three or four weeks before blooming. This, with ample manuring, assists in ensuring a good setting of fruit.

Preparation for Drying.

As there is very little likelihood of any export of fresh fruit during the coming season, there is every probability of Australian fruit markets being glutted. For this reason, growers should make preparations for drying part of their crop.

Where the climate is not suitable for sun-drying, evaporators will have to be used. There are small machines on the market, which would suit small individual growers, but the work could be carried out more economically in every way if neighbouring growers could unite and operate a larger plant between them.

Besides the evaporator, a sulphuring chamber and a room or shed in which to prepare the fruit would be necessary. The machinery for preparation of the fruit need not be extensive. Combined peelers, corers and slicers, pitting knives, spoons, dipping baths, baskets, sweat boxes, and a plain table or bench, practically completes the outfit.

Details of the process were published in the January and February issues of the *Agricultural Gazette* in the present year.

It should be borne in mind that only suitable varieties should be dried.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Gilgandra P. and A. Association	G. Christie ...	Sept. 5, 6
Ganmain A. and P. Association	T. S. Henderson...	,, 11, 12
Young P. and A. Association	T. A. Tester ...	,, 11, 12, 13
Lockhart A. and P. Society	E. D. Arnold ...	,, 12, 13
Cowra P., A., and H. Association	E. W. Warren ...	,, 18, 19
Narrandera P. and A. Association	H. S. Robinson ...	,, 18, 19
Temora P., A., H., and I. Association	A. D. Ness ...	,, 18, 19, 20
Holbrook P., A., and H. Society	J. S. Stewart ...	,, 19, 20
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Agricultural Gazette of New South Wales.

Varieties of Maize in New South Wales.

[Continued from page 644.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

Hickory King.

THE large attractive white grain of this variety has caused it to be much more popular than it rightly deserves Yet it is so much in demand on the market, at times when the cornflour millers are buying, that it is perhaps just as well that it has one redeeming feature, *i.e.*, its ability to do better than most varieties of maize on poorer soils. It has been grown in this State for a considerable number of years, and is perhaps one of the best known varieties. Its culture has therefore considerably extended into nearly every maize district on the coast. On account of this, there is undoubtedly considerable loss in yield on the average or better class maize soils from growing this variety. Experiments carried out by the Department during the last seven or eight years on the coast have shown this variety to be considerably outyielded by others, some of which are less known. In consequence of the demand for this variety by cornflour manufacturers, and the lower yields obtained from it on most maize soils, it is urged here that there should be an increased price given for this maize to compensate growers for its lower yield. This would also indirectly encourage its growth on poorer soils, for which it is undoubtedly the best variety of maize we have.

There is a general impression amongst farmers that white varieties of maize do better on poor soil than the yellow kinds. This notion has arisen from the behaviour of two or three white varieties, of which this statement is true; but it cannot be stated as a general axiom, for we have only to consider that the variety Boone County White is almost a failure on poor soils where Hickory King can be successfully grown.

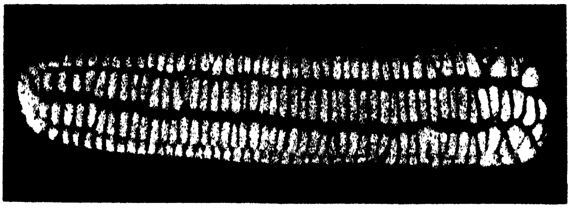
Hickory King is of about the same period of maturity as Boone County White. It takes about five months to mature on the coast. It seems as if there are several strains of Hickory King which differ slightly in their maturity, and there are also at least some strains which have become acclimatised by growing on the highlands and have considerably shortened their growing period in consequence. It has also established a reputation for doing rather well on the highlands for green fodder.

The stalk growth is somewhat fine, and the variety suckers rather freely. These characters have made the variety popular for fodder, but, unless early feed is required, it will be considerably outyielded on the coast by Improved Yellow Dent. The ears are borne on long, rather thick shanks (some shanks being over 12 inches in length), and they mostly droop at maturity. The husk covering is not good, and many erect ears are spoilt when the weather during ripening is wet.

The ears are cylindrical in shape, and the standard size weighs from 12 to 14 oz., and is 8 to 10 inches in length and 6 to 6½ inches in circumference. The dent is smooth to slightly rough, and the number of rows is eight or ten, and sometimes twelve. In the eight-rowed ears there is usually a large space between the rows, which is not so marked in the 10-rowed ears, which usually shell more grain. There is a great tendency in this variety to irregular grain. Very few ears have not at least one grain which is irregular or out of place. This is probably due to the wide furrow between the rows. The rows at the butt are either irregular or wide apart. The tips of the ears are not too well filled, and the butts are not well rounded. The grain is tight on the cob, and the cores are usually small.

Hickory King on poor land at Grafton, 1916.

The grain is thick, $\frac{8}{16}$ to $\frac{9}{16}$ inch broad and about $\frac{8}{16}$ inch deep. It is pearl white in colour and has a germ of fair size, though it may appear small to the size of the grain. The different strains vary somewhat as to the percentage of grain they shell. There is also a difference in the shelling percentage, according to the fertility of the soil on which the crop is grown, as low as 80 per cent. shelled grain has been obtained on fertile soil and up to 89 per cent. on poor soil. About 700 to 800 grains go to the pound, and, comparing this figure with that of Leaming, which takes about 1,400 grains to weigh a pound, it will be observed that, for the same soil, it would take about 20 lb. of seed of Hickory King to sow an acre to give the same number of plants as 10 lb. of Leaming.



Hickory King.

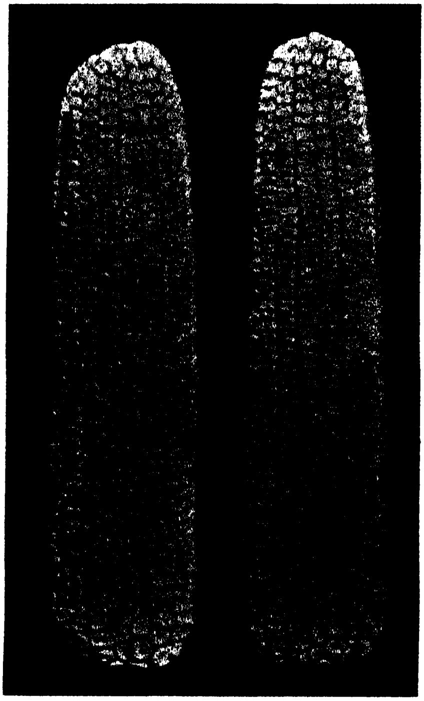
In 1910 Hickory King gave a yield of 27½ tons green fodder per acre at Moss Vale, beating all other varieties tried for comparison.

Silvermine.

This variety was originated by Mr. J. H. Beagley, Sibley, Illinois, U.S.A., as recently as 1895. It is another instance of the result of pure selection, and a further example of what can be done to improve maize by this simple method. It was originally selected for its well-packed cylindrical ears of regular grain, short stalks, and good production of ears for the size of the stalk.

It was introduced to this State several years ago, and became popular on the Northern Tableland and Western Slopes on account of its earliness and drought resistance. On account of the prejudice against its white colour (it was commonly supposed to be much inferior to yellow in feeding value) its popularity waned and it almost went out of cultivation. At that time there was a difference in market price of 6d. per bushel in favour of yellow maize over white; but in recent years the manufacture of cornflour has assumed a greater scale, and the popular prejudice concerning the difference in feeding value of yellow and white maize is gradually disappearing, with the result that the price of white maize is not usually far behind, and is even sometimes in advance of yellow. This variety (Silvermine) was therefore reintroduced from America a few years ago, and it is already giving promise of establishing itself in such districts as the Northern Tableland, Western Slopes, Murrumbidgee Irrigation Area, and the far South Coast (as an early crop). It will mature in 4½ months on the coast, taking a week or two longer in colder climates. Even on rich soil it does not grow very tall. A plot at Pambula last season grew no more than 6 feet, when Improved Yellow Dent ran up to 12 or 14 feet. Even then the greater percentage of stalks bore two ears. It is distinguishable by its slender stalks, which, under good conditions, bear large ears. On fertile soil it readily produces two or more ears per stalk, and even under adverse conditions the ears are larger than would be expected. It has thus acquired its reputation as a drought resister. The shanks are long, and the ears droop at maturity. The husk covering is good.

The ears are cylindrical in shape, never very large, 10 to 13 oz. in weight, 8 to 9½ inches in length, and about 6½ to 7 inches in circumference. The dent is rough and mostly pinched, with the upper extremity drawn out into a projecting beak or spur. The rows are extremely straight and regular, with narrow furrows between them. The tips are well filled, and the butts small and well rounded. The grains are tight on the cob, and the cores are small and very light in weight. The ears usually shell about 86 per cent. grain. The number of rows varies from sixteen to twenty.



Silvermine.

The grain is somewhat thin, about $\frac{5}{16}$ inch broad and about $\frac{8}{16}$ inch deep. It is of a creamy white colour and has a small to medium sized germ. The cap is also of medium size. The grains average about 1,300 or 1,400 to the pound, and a stand of at the most 5,000 plants (*i.e.*, about 4 lb. of seed) is sufficient for an acre in the western district under dry conditions.

There is a much larger grained white variety of maize grown under the name "Silvermine" on parts of the South Coast. It does not seem to grow a tall stalk, and the grain is pinch dented, with a projecting beak. But here ends the resemblance with the true Silvermine described. The ears are very large and the cores somewhat thick. It would not be a drought-resistant type suitable for growing in the western district. It is believed to be a cross between a large yellow or white variety and Silvermine, which has since become fixed.

Very little reliable data is yet available regarding the yields of this variety, but at Milton last season (1916) Silvermine proved the best of ten varieties, with a yield of 107 bushels per acre.

Reid's Yellow Dent.

This variety is the result of a cross between a red and a yellow variety by Mr. Robert Reid, in Illinois, U.S.A., in 1846. After many years of selection to a certain type the present variety was evolved. It is the result of a vigorous selection to type which has given us the strongly-marked characters in this variety, which seem to be very well fixed. It is one of the prettiest varieties for symmetry of ear and regular uniform grain that we have, and it wins most of the prizes at the shows where it competes. It has been bred on fertile soil, and has preserved this character to a large extent in that it still requires the best conditions of soil and rainfall (or irrigation) for its growth. Under such conditions it yields an extremely good crop. It has given good results in this State on rich soils on the South Coast, but is somewhat too early and too soft for growing on the North Coast. It has also done well on rich alluvial flats on the Western Slopes. It is extensively grown in Victoria on the rich flats of the Snowy River, where it is said to have yielded 150 bushels per acre. It matures a few days later than Silvermine.

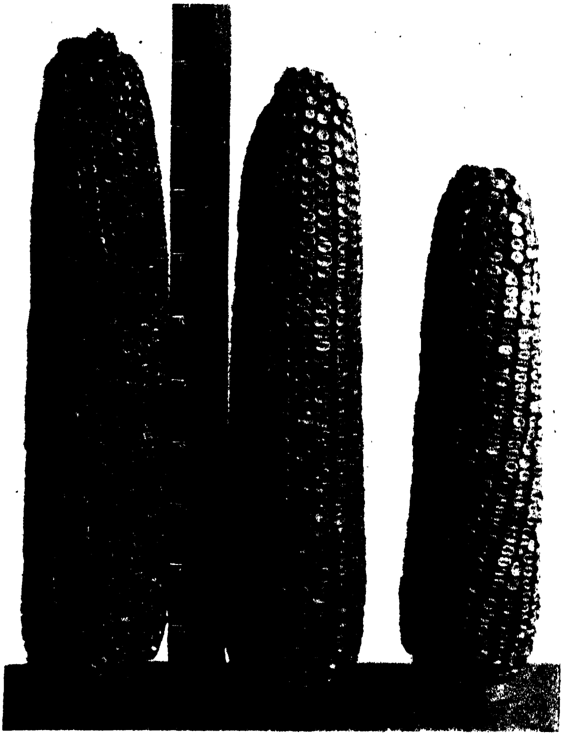
The stalks are slender and they sucker somewhat freely on rich soil, though not as badly as some varieties. They do not grow very tall, and there are often two or more ears on the stalk when the crop is grown under its natural conditions. The ears are borne on long, rather slender shanks, and they turn down easily at maturity. The husk covering is moderately good.

The ears are cylindrical in shape, 9 to 11 inches long and about 7 inches in circumference. The rows are straight and regular right down over the butt and throughout the length of the ear, except for about $\frac{1}{2}$ to 1 inch at the tip. The dent is rough and often pinched. The rows vary from eighteen to twenty-four, and the tips are usually well filled, but sometimes bare tips (about half an inch or so) are found. The space between the rows is very small, and the rows run in pairs, *i.e.*, with a wider space between every two rows. The grain is fairly tight on the cob, which is comparatively small in size. The shelling percentage is very good—usually being about 86. The shank attachment is small. and the butt deeply rounded. The dovetailing of the grain in the rows which pair and the angled outline which this causes on the side of the grain distinguish Reid's Yellow Dent easily from most other varieties. The grain is also light in colour compared to the dark red core.

The grain is thin, $\frac{5}{16}$ to $\frac{6}{16}$ inch broad and $\frac{8}{16}$ to $\frac{9}{16}$ inch deep. The colour is mostly pale yellow, and the caps differ only slightly from the colour of the body of the grain. There sometimes appear, however, ears with a medium red colour of grain, due probably to the early breeding of the variety. The germ is large and the cap small. Although the grain is light yellow in colour, it is not a starchy yellow. It is, however, not a very hard grain. A pound of grain will contain about 1,200 to 1,300 kernels.

Funk's Yellow Dent.

This variety is stated by all authorities to be the result of pure selection from Reid's Yellow Dent. The resemblance between the two varieties can be seen to a large extent; but with more rigorous selection it is expected that the existing difference between the two varieties will be as great as the difference in their adaptability to different conditions. Whatever advantages may be claimed for Reid's Yellow Dent, its suitability for any but the best conditions can never be averred of it. This, however, can be said truly of Funk's Yellow Dent. For it is perhaps a variety that has forced itself upon our notice by its sheer worth, and it may be said that it is likely to become, ere long, one of the best known varieties in the State. This is a clear case where the detailed description of a variety is important; and too great attention cannot be paid to the difference in ear characters and grain between these two varieties, in view of the wide difference in their behaviour to different soils and conditions.



Reading from left to right:—
Reid's Yellow Dent; Funk's Yellow Dent; Early Yellow Dent.

In this State Funk's Yellow Dent has shown well to the fore in comparison with other varieties on the Northern and Central Tablelands, North-western Slopes (in some of the precarious maize districts), and particularly in the Inverell district, Western Slopes, Murrumbidgee Irrigation Area, and the

South Coast (as an early maize). The only locality where it does not do too well is the North Coast. It is somewhat unsuitable for this district in any case, on account of its poor husk covering. This deficiency puts it out of court at once in a district where weevils breed so quickly. It will mature in about 4½ months (about the same as Silvermine), taking a week or two longer on the tablelands.

It has somewhat the same field characters as Reid's Yellow Dent, slender short stalks, with long thin shanks bearing drooping ears. The husk covering is, as stated, rather poor, but this defect is not observed greatly in some districts.

Funk's Yellow Dent at the farm of Mr. J. Ditzell, Inverell, Season 1916–17.

Yield, 76 bushels per acre.

The ears are cylindrical, and of approximately the same length and circumference as Reid's Yellow Dent. They may, in some instances, be a trifle longer and narrower. The rows vary from sixteen to twenty-two, or even twenty-four, according to a somewhat varying type. The rows are very straight, but the space or furrow between them is usually of medium width though shallow. The rows do not run so markedly in pairs, as in Reid's, the furrow between every row being mostly about the same width. The sides of the grains are therefore rounded in outline, not sharp-angled as in Reid's.

The grain is very tight on the cob. The cores are of small to moderate size, and somewhat light in colour. The percentage of grain is not as good as Reid's, being from 83 to 85 per cent.

The grain is thick, about $\frac{6}{16}$ inch broad and $\frac{7}{16}$ to $\frac{8}{16}$ inch deep. It is thicker and shallower than Reid's, and the dent is smooth to slightly rough. The colour of the grain is a fairly dark amber with a small yellow cap—somewhat resembling Leaming in appearance, but thicker and shallower than this variety. The germ is very large, and extends well into the back of the thick grain. A pound of grain will contain from 1,100 to 1,200 kernels.

At Singleton in 1910 Funk's Yellow Dent yielded 71¾ bushels per acre, beating a local early yellow variety by over 20 bushels per acre. At Inverell, in 1916, a yield of 76 bushels per acre was obtained. In 1911, at Quirindi, it beat all other varieties tried against it, giving 61 bushels per acre.

Early Yellow Dent.

This variety was introduced from Victoria some years ago, and was tried at the Glen Innes Experiment Farm, where it came to stay. Its value as an early maturing maize was at once seen, as it was essential to have a variety that could be depended on to mature in this district, where unseasonable late spring frosts and early autumn frosts come so unexpectedly. This variety is the earliest dent maize so far grown in this State, and though not as early as some of the flint varieties, it will considerably outdo these in yield. It is quite suited to the ordinary upland New England soil. It will mature in four months on the coast, but is not suitable here as an early variety. It takes a few weeks longer to mature on the tablelands. On account of its earliness it has acquired a name for drought resistance. It can be sown in December in the Inverell district and will mature before frost, and a good word is spoken for the variety on the Western Slopes.

The stalk is short, and thick at the base. It seldom goes beyond 6 feet in height, and is often only about 5 feet. The ear is borne 2 to 2½ feet high on the stalk, and often stands erect on a short thick shank. The husk covering is only moderately good.

The ears are tapering, about 8-9 inches long, 6½ to 7 inches in circumference, and weigh from 10 to 12 oz. The dent is smooth, and the number of rows fourteen to eighteen. Rows are often slightly irregular, with several grains out of line in the row, or else the rows are dropped as they near the tip. The tips of the ears are usually very well filled. The space between the rows is medium to large, and the grain is tight on the cob.

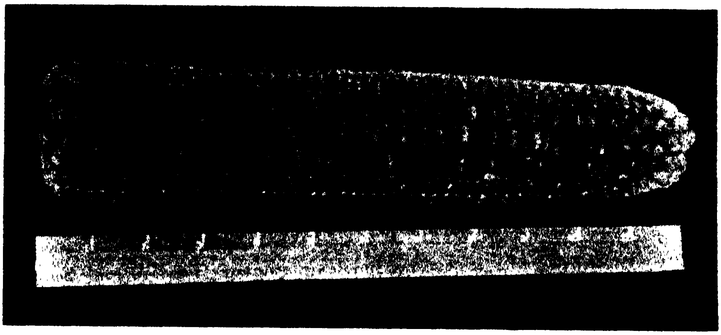
The grain is fairly thick, $\frac{6}{16}$ to $\frac{8}{16}$ inch broad and $\frac{7}{16}$ to $\frac{8}{16}$ inch deep. The colour is a pale amber or yellow, and does not show much variation between the cap and the grain. The cap is small and the germ large. The cores are rather large, and the variety shells about 80 per cent. corn. A pound of grain will contain 1,100 to 1,300 seeds.

At Tenterfield, in 1912, Early Yellow Dent outyielded all other varieties tried against it, with a return of 34½ bushels per acre, and yields of over 40 bushels per acre have often been obtained at Glen Innes Experiment Farm over large areas.

Early Clarence.

This is quite a local yellow variety grown extensively in the Tumut district, and is an example of how a variety can be acclimatised readily to a different district, and how, once this is done, it seems to excel others which do not possess this advantage. It is supposed to have been brought from the Clarence River many years ago by farmers who moved to the Tumut district, and after acclimatisation for a few years, it apparently came to stay. During the process of acclimatisation it probably developed new characters which were more suited to its new environment. These, at any rate, differ so much from any other maize grown in the State that it is now a distinct variety.

Although called Early Clarence, it is not as early as some of the other varieties before described, and if brought to the coast it would be of mid-season maturity compared with the early and late varieties grown there. In the Tumut district it matures in about 5½ months.



Early Clarence.

The stalks are thick and do not grow very tall, even on the rich flats in this district. The ears are situated at a moderate height on the stalks, and the shanks are stout and of medium length. The husk covering is open to much improvement, but this is not such an important matter in this district, from the weevil point of view, as the insect pest does not exist.

The ear is large, cylindrical in shape, often weighing 1½ lb. and being over 12 inches long, with a large thick core giving it a large diameter. The dent is fairly rough, and the number of rows varies from sixteen to twenty. The rows are fairly straight, with a medium to small space between them. The grain is tight on the cob, and the ears shell a percentage of about 78 to 80

The grain is thick, about $\frac{7}{16}$ inch broad and usually not more than $\frac{8}{16}$ inch deep. It tapers more rapidly than most other varieties, and a broad shouldered tip is usually deficient. The grain is of excellent colour and quality, due to the slow drying and low humidity of the autumn climate.

From 80 to 100 bushel crops are common with this variety in the Tumut district.

MOUSE PLAGUES.*

THE recent visitation of mice in this State has had its counterpart at different times in various countries, and it assumes considerable importance where there are stretches of agricultural land controlled by a comparatively small number of settlers. Exceptional numbers of mice have been known to infest small districts even out on the western and north-western plains in this State, far away from agricultural lands, but the damage done has been limited in character, and in consequence little notice has been taken.

Various parts of the United States have been visited in this way, and publications dealing with the matter have been issued by the Department of Agriculture there. In one of these, issued in 1908, and written by Stanley E. Piper, particulars are given of the measures taken to check the plague in Nevada. The outbreaks there have been exceptionally severe, because they occur in rich lands, more or less restricted by surrounding desert conditions. The trouble has lasted three or four years, and it was found necessary to take very stringent measures.

Poison is claimed to be the cheapest and most certain means at present known of controlling mouse plagues. Phospho. us is condemned on account of its dangerous character and its destructiveness to birds and mammals. As the result of extensive experiments and practice, strychnia sulphate was found to be the most satisfactory poison. Strychnia sulphate, when prepared in the following ways, was found to be the cheapest poison available :—

1. *Poisoned Lucerne Hay.*—Chop 30 lb. of good fresh lucerne hay into about 2-inch lengths with a feed cutter. Then place the hay in a large metal receptacle and sprinkle with 3 gallons of fresh water. Thoroughly dissolve 1 oz. of strychnia sulphate in 2 gallons of water by heating in a closed vessel; sprinkle over the dampened hay and mix well.

2. *Poisoned Green Lucerne.*—Heat 1 oz. of strychnia sulphate in half a gallon of water until thoroughly dissolved, add to 1 gallon of cold water, and sprinkle this solution slowly over 45 lb. of fresh green lucerne, cut into lengths of 2 or 3 inches. Mix until the free solution is taken up.

3. *Poisoned Crushed Wheat.*—Dissolve 1 oz. of strychnia sulphate in 2 gallons of water by heating. Sprinkle the solution over 60 lb. of rolled or crushed wheat in a metal receptacle, and mix well. If the preparation is to be kept for several days, two tablespoonfuls of powdered borax may be added to prevent fermentation.

The poisoned hay was found of best use in the winter when green food was absent. Men were employed to drop small quantities (about a teaspoonful) at the mouth of burrows. In some fields it was calculated that there were 10,000 to 24,000 mouse-holes to the acre, and it is said that a systematic treatment of the land resulted in the destruction of 85 to 95 per cent. of the mice.

Poisoned green lucerne proved very successful, as the mice had been in the habit of feeding on the lucerne. Poisoned crushed wheat was distinctly better than the whole grain, but this *is not to be recommended for field use,* because a large number of useful birds fell victims to the poisoned grain. With the poisoned green lucerne and lucerne hay no accidents to birds or domestic animals were reported.

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* For much of this information we are indebted to an article by H. A. Longman in the *Queensland Agricultural Journal.*

Further Experiments with Grain Sorghums.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

Value of Acclimatised and Selected Seed.

THE grain sorghums, including Standard Milo, Feterita, Manchu Kaoliang and Kafir Corn, have now been grown at various experiment farms for three years in succession. During that time special attention has been given to the harvesting of selected types of seed, the principal aims being uniformity and compactness of head. The value of this selection was well proved during the past season, when not only was there a much improved germination of the seed, but a much greater uniformity of type in all the crops. The improvement over the first year's crop from seed imported from America was noticeable at all the farms, and there appears little doubt that acclimatisation and selection will play a prominent part in the development of improved types.

As pointed out in previous articles, these sorghums are grown principally for the nutritious qualities of the grain, but the fodder produced is by no means negligible. Fortunately, their success is most promising in districts where maize will not set its grain sufficiently to make it a paying proposition. This is the case in some districts on the Western Slopes and in parts of the Yanco Irrigation Area.

Results at Yanco Experiment Farm.

Mr. J. M. Pitt, Experimentalist, Yanco Experiment Farm, reports as follows :—

The results from the grain sorghums during the past season are sufficiently encouraging to justify the recommendation that they should be sown again on a larger scale. Owing to their heavy yields of grain and their drought-resisting capabilities, these sorghums give promise of becoming equally as important as maize, especially in the drier regions of the State.

Owing to the depredations of sparrows, accurate results last season were out of the question; but it can be said with safety that the yields of grain of at least two varieties, viz., Kafir Corn and Standard Milo, were far in advance of those obtained from the plots of Silvermine maize adjoining. Most of the varieties show unevenness in ripening and a slight variation in type, which, no doubt, will in time be overcome by careful selection. Noticeable features were the sparse growth of foliage in comparison with the saccharine sorghums (especially so in the Standard Milo), and the large heads developed; a few heads of Standard Milo and of Kafir weighed well over half a pound each when quite dry.

To test the palatability of the grain, a quantity was fed to horses and poultry with satisfactory results.

Manchu Kaoliang.—This is a very early maturing variety, requiring approximately three and a half months. It grows to a height of about 5 feet, the stalks being thin and sparsely leafed; stools poorly; heads not as large as Kafir or Standard Milo. This was the only variety requiring hilling. Unfortunately, sparrows took the grain before it ripened, not a head being left to harvest. The plants were cut off early in February, and a further growth of 4 feet took place, which would have ripened seed again before the Kafir Corn if allowed. On appearances, an estimate of the yield would be about half that of the latter variety. The heads on the second growth are smaller and more branched than those of the first. This variety stands dry conditions well.

Feterita matures a little later than Kaoliang. The germination was poor. It stools well, and carries a moderate amount of foliage; grows to 5 feet. A few ripe heads were harvested during the latter end of February, but sparrows reaped the greater portion. An estimate of the yield would place this variety a little before Manchu Kaoliang. The grain is pure white in colour and large in size.

Kafir Corn is a very late variety, and uneven in maturing, taking over six months to ripen the last of the heads. The germination was good. The growth all through was slow, only one thickish stem, with broad leaf foliage, growing from each seed. In height it reaches 4½ feet; stands drought and excessive moisture well. Although grown thickly in the rows, this variety gave an exceptionally heavy yield of seed, each stalk carrying a thick compact head averaging fully 9 inches in length. An estimate of the yield cannot be given, owing to sparrows harvesting from 30 to 50 per cent. of the crop, but at Mirrool, this variety yielded up to 121 bushels per acre. The grain is white, and smaller than Feterita.

Standard Milo.—This is another late variety, taking about five and a half months to completely mature. The germination was poor, perhaps owing to excessive moisture. It stools well, has fairly thin stalks, and is very sparsely foliaged; grows to a height of about 5 feet. The heads are very large and compact. It was more even in type and maturity than any of the others. The grain is large, and of a light brown colour.

The sparrow menace is very serious, and the early varieties of the grain sorghums suffer severely from their depredations. The late varieties, ripening at a time when there is an abundance of other food about, stand a better chance.

The yield of maize adjoining was 27 bushels per acre.

Nyngan Demonstration Farm.

For the sake of comparison, Amber Cane, Imphi, and *Sorghum saccharatum* were grown with the grain sorghums. In the case of the latter, locally selected acclimatised seed was used. The crops were superior to those of previous years, both in uniformity of type and in yield. Kafir Corn was

Feterita at Nyngan Demonstration Farm.

Manchu Kaoliang at Nyngan Demonstration Farm.

FURTHER EXPERIMENTS WITH GRAIN SORGHUMS.

grown as in previous years, but owing to its very slow maturing qualities it cannot be considered satisfactory from a grain-producing point of view. It will be noticed that Manchu Kaoliang gave a smaller yield than the others, owing to the fact that the cool moist summer was to its disadvantage. The results for the past two years have demonstrated the fact that it is much more profitable to grow the grain types than the saccharine types.

The results of the trials were as follows:—

Variety.	Order of Maturing.	Grain Yield per acre.	Fodder Yield per acre.
		bushels.*	tons cwt.
Grain Sorghums—			
Manchu Kaoliang	1	12	1 5
Standard Milo	2	21	2 15
Feterita	3	14	2 2
Saccharine Sorghums—			
Amber Cane	1	12	2 17
Imphi	2	7	1 15
Sorghum saccharatum	3	4	0 14

* 1 bushel = 60 lb.

Hawkesbury Agricultural College.

Mr. W. D. Kerle, Experimentalist at the above institution, reports as follows:—

The varieties under trial were five in number, viz.:—

White Kafir Corn.	Manchu Kaoliang.
Standard Milo.	Proso or Hog Millet.
Feterita or Sudan Dhoura.	

It may be mentioned that the last of these, Proso, is not a grain sorghum, but it was tried to test its capacity as a grain producer in comparison with the sorghums.

The seed was sown on red volcanic loam of a sandy nature, 6 lb. of seed per acre being used. Superphosphate to the amount of 2 cwt. per acre was uniformly applied. The sowing was made on 18th December, according to the following plan:—

Buffer row—White Kafir.

5 chains.

Headland, 100 links wide.

50 links. 50 links.

11 rows.	11 rows.	11 rows.	11 rows.	11 rows.	11 rows.	11 rows.
White Kafir Corn. (*Check.*)	Proso or Hog Millet.	Manchu Kaoliang.	White Kafir Corn. (*Check.*)	Feterita or Sudan Dhoura.	Standard Milo.	White Kafir Corn. (*Check.*)

Headland, 100 links.

5 chains.

Buffer row—White Kafir.

The area cut of each plot was one-fourteenth of an acre.

All varieties gave an approximate germination of 90 per cent., with the exception of Standard Milo, which fell to approximately 75 per cent.

The weather conditions being favourable, the growth was very satisfactory. Cultivation between the rows on 27th December, 20th January, and 21st February kept the ground clean and free from weed growth.

White Kafir at Hawkesbury Agricultural College.
10 tons of fodder and 44 bushels of seed per acre.

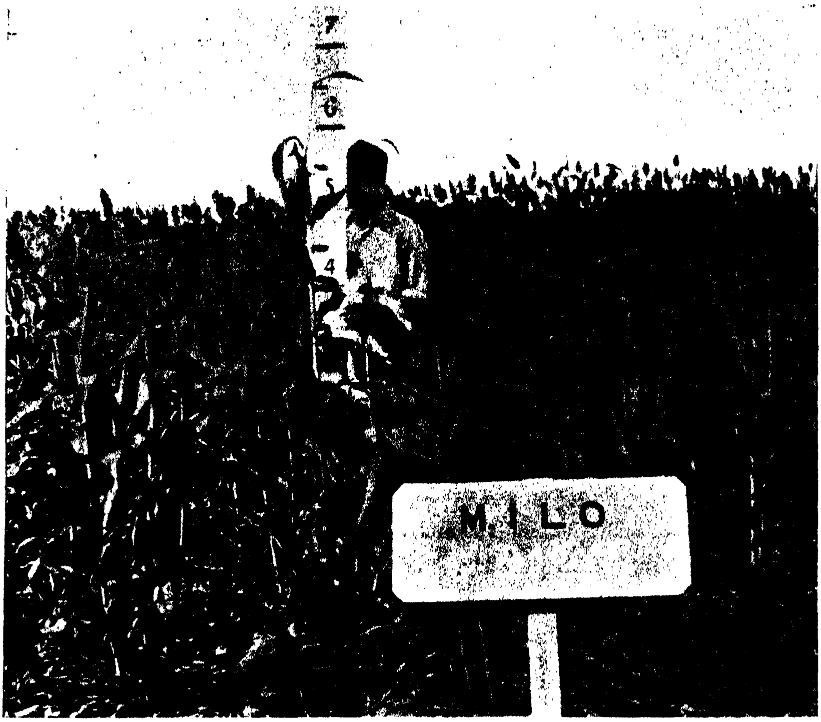
In the following table are recorded observations with regard to maturity and rainfall distribution :—

Variety.	Period between Sowing and Flowering.	Period between Sowing and Seed Maturing.	Date of Sowing.	Date of Harvesting	Rainfall for Period
			1916.	1917.	Points.
White Kafir	90 days	112 days	18 Dec.	9 April	765·5
Standard Milo	75 ,,	98 ,,	,,	26 Mar.	752·5
Feterita	70 ,,	91 ,,	,,	19 ,,	715·5
Manchu Kaoliang ...	55 ,,	75 ,,	,,	3 ,,	685·5
Proso Millet	30 ,,	45 ,,	,,	31 Jan.	334·5

The seed heads harvested were bagged and threshed with the flail. Soon after harvesting the seed, the stalks were cut and fed to pigs and cattle. The crop was free from disease, but suffered a great deal from the depredations of birds.

Following are the grain and fodder yields :—

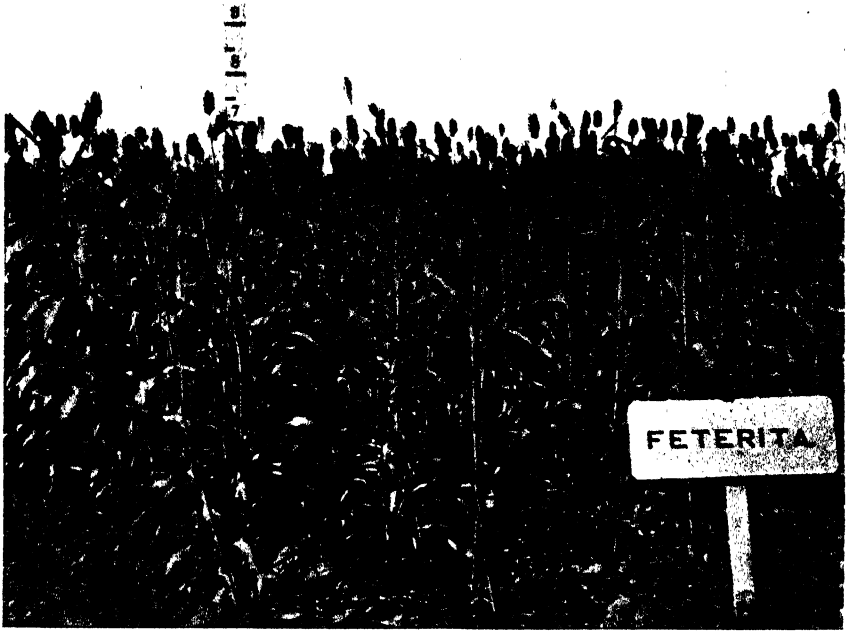
Variety.	Fodder.					Grain.	
	Acre Yield.				Percentage Yield.	Acre Yield.	Percentage Yield.
	t.	c.	q.	lb.		Bus.	
White Kafir (*check*) ...	10	1	2	0	100	44	100
Proso Millet	0	12	2	0	6·23	9½	21·92
Manohu Kaoliang ...	3	4	3	12	32·11	17	39·85
White Kafir (*check*) ...	9	18	2	21	100	42	100
Feterita	9	4	1	0	92·47	39½	93·31
Standard Milo	3	6	3	4	33·15	38	89·07
White Kafir (*check*) ...	10	0	3	0	100	43	100



Milo (Grain Sorghum) at Hawkesbury Agricultural College.
3 tons 6 cwt. fodder and 38 bushels seed per acre.

White Kafir Corn.—This variety germinated excellently, and subsequently stooled out well. The stems are fairly thick, with short internodes, and at maturity they reached 7 feet in height. The leaves are long, broad, and numerous, with overlapping sheaths. The pith juice is fairly abundant, and in taste sweet to sub-acid. The heads are erect and compactly filled with plump seed, obovate in shape and hard in texture. The stalk is readily eaten by pigs and cattle.

Standard Milo.—The seed germinated thinly, but stooling was fairly prolific. The plants, when mature, were 5 feet in height. In comparison with White Kafir, the stems are thicker, the internodes longer, the pith juice more acid, and the leaves less abundant, consequently it is not so valuable as a stock feed. The heads are erect or gooseneck, ovate in shape and compact. The seeds are large, flattened and soft in texture. It matured eight to fifteen days earlier than White Kafir. The gooseneck type of head predominated, and invariably produced more seed than the erect type. The gooseneck, however, is a distinct disadvantage in harvesting, threshing, &c.



Feterita at Hawkesbury Agricultural College.
9 tons 4 cwt. green fodder and 39½ bushels seed per acre.

Feterita.—This variety germinated and stooled very well. Feterita is slender stemmed, with medium abundant leaves. In the trials it grew to a height of 7½ feet. The heads are erect and compactly filled with a large white grain of medium texture. The juice is sweet to sub-acid. After the seed has been harvested, the stalks are readily eaten by stock. It is a week earlier than Standard Milo in maturing, and compares favourably with White Kafir, both for grain and for fodder.

Manchu Kaoliang germinated excellently, but did not stool. It was irregular in height, averaging 8 feet at maturity. The stems are pithy and without juice, the leaves narrow and scanty, and the stalks very slender. As a stock feed it is practically useless. The heads are erect, loose and fairly open, and the grain, which is brown in colour and tightly held in a reddish-black glume, is harder in texture and smaller in size than any of the foregoing varieties. Although all other varieties were badly attacked by birds, Manchu Kaoliang was hardly touched.

Proso or Hog Millet germinated excellently and stooled fairly well. It grew to a height of 18 inches when mature. The stems are thin and scantily leafed, the heads open, and the grain small, of a rich brown colour and glossy appearance. It commenced to come into ear when 9 inches high, and began to ripen seed within five weeks from sowing. The seed does not ripen uniformly and shatters very badly. The crop was cut with a reaping hook. It is difficult to harvest, and in every way is a most unprofitable and comparatively useless crop.

Manchu Kaoliang at Hawkesbury Agricultural College.

3 tons 4 cwt. green fodder and 17 bushels seed per acre.

Summary.—White Kafir Corn is superior in grain and forage yields to the other grain sorghums under trial. Feterita and Standard Milo are practically equal in grain production, and probably, with uniform stands, in yield of forage. Manchu Kaoliang is inferior to the foregoing varieties in yield of grain in a favourable season, although, judging by last season's trial, superior under drought conditions. As a forage it is practically valueless. Proso or Hog Millet has nothing to recommend it for either grain or forage; it possesses many very undesirable characteristics.

Conclusions.

The yields of grain, as shown in the foregoing experiments, are sufficiently satisfactory to justify the Department in recommending certain varieties for their grain alone in districts of low rainfall, or in districts where the yield exceeds that of maize. In addition, the fodder produced remains green up to the time of harvesting the seed, and can be utilised either as roughage for pigs or as ensilage for dairy cattle.

The reluctance of farmers in this State to grow these sorghums appears to be based principally on ignorance as to the nutritive values of the various grains. The prejudice against the grains has completely disappeared in America, and at the present time millions of acres are cultivated, and the grain is fed to all classes of stock.

It has been ascertained by various experiments there, that the grain of Kafir and Milo is only slightly inferior to maize as a food for stock. The grain of the principal varieties, together with that of the best local maize (Silvermine) at Yanco Experiment Farm, was analysed by the Chemist of this Department to enable comparisons to be made with the American results.

The official analyses are as follows :—

	Feterita.	Standard Milo.	Kafir.	Silvermine Maize.
	per cent.	per cent.	per cent.	per cent.
Moisture	15·52	15·16	14·48	14·93
Ether Extract	2·05	1·99	2·87	4·02
Albuminoids	10·94	11·27	11·05	9·63
Fibre	1·55	·85	3·04	1·77
Ash	1·98	1·81	2·58	1·59
Nitrogen-free extract	67·96	68·92	65·98	68·06
Albuminoid ratio	1 : 6·63	1 : 6·51	1 : 6·55	1 : 8·00
Nutritive value	83·5	84·7	83·5	86·7

The results of these analyses should remove all hesitation farmers have about using the grain for stock feed, for, while the albuminoid ratios of all are higher than that of maize, the nutritive values are only slightly less. An interesting feature is the fact that the grain of Standard Milo is superior in all respects to that of the better known Kafir.

It is now felt that the grain sorghums have proved promising enough in these and previous experiments to justify their extension amongst farmers generally, and it is intended to cultivate them in several farmers' experiment plots during the season 1917–18.

Guernseys at Wollongbar Experiment Farm.

A. H. HAYWOOD, Manager.

THE Guernsey breed was practically unknown in Australia prior to the year 1898, when the Government imported three bulls (Peter, Nutcracker, and Rose Prince). The first two were sent to Wollongbar, and the last to Kirkham and later on to Berry Farm. The cows, six in number, were Calm, Vivid, Lady Blanche, Flaxy, Souvenir, and Saucy Sal, all of which went to Kirkham. When the stud there was removed to Berry, Souvenir and Lady Blanche were sent to Wollongbar, but the latter died from pneumonia shortly after landing at Ballina.

In 1907 twenty females were imported, and were distributed between the studs at Berry, Wollongbar, and Hawkesbury Agricultural College.

In 1911 three cows were imported, viz., Flower of the Preel, Beechwood Pearl, and Desdemona VIII, and all were sent to Berry Farm. Of six bulls imported at that time, Hayes' Fido was sent to Wollongbar, Trengwainton Village Favourite to Berry, Godolphin Moses to Glen Innes, and Sequel's Lad to Hawkesbury Agricultural College. Rosehill and Prince of Warrenwood were put on lease, and shortly afterwards Godolphin Moses and Sequel's Lad were also transferred to lease account. A herd was established at Grafton, but later all Guernseys were collected at Wollongbar, where they now form the only Guernsey herd in the Department. At the present time it is possibly the largest herd of pure Guernseys in the world, numbering 140.

The prime function of the stud, so far, has been to supply sires of proved excellence to the farmers of the State; females are not yet available for sale.

The best judges of dairy stock who inspected the first importation of Guernseys, were unanimous in their verdict as to its being a breed likely to suit our conditions. A series of experiments, instituted in 1899 by the Dairy Expert, and carried out at Wollongbar Experiment Farm, attracted a lot of attention to the breed, and the tests panned out in favour of the Guernsey, compared with Ayrshire and Shorthorn cattle. The tests were framed to afford information upon the following issues :—

(*a*) To ascertain the influence, if any, of the sire in relation to the milk yield of his progeny.

(*b*) To determine whether it is possible, through the influence of the sire, to obtain from beef-bred animals heifers that show marked dairy tendencies; or, in other words, to see if it is possible to "cross-out" beef and "cross-in" milk in one or two generations by the influence of the bull.

(*c*) To find out what breed of cattle, if any, is most effective in bringing about (*a*) and (*b*).

(*d*) To ascertain the value of the Guernsey cross on the local cattle of the Shorthorn type in the Richmond River district.

It was found that the progeny of the Guernsey bull on the Beef Shorthorn cow gave more than double the quantity of butter that the dam gave.

The test also demonstrated that the Guernsey sire increased the milking period of the progeny, as well as the quality of the milk. Striking results were obtained when Guernsey bulls were crossed on the cattle of the Richmond River.

The Departmental policy of leasing Guernsey bulls to farmers was another factor in the impetus given to the breed in this State, where it now enjoys a wide and increasing popularity, as is borne out by the record number of bulls sold for the year just ended.

For more than a century the improvement of Guernseys has been carefully fostered in their island home. There is a certain plainness of form in the Guernsey, which is explained by the fact that it has been bred for utility rather than beauty of form. The animals are highly adapted to temperate climates and good pastures, but they are successfully kept under very varied conditions. Some of the world's record butter yields have been put up by Guernseys in Wisconsin, U.S.A., a very cold State.

The Guernseys are specially valuable for crossing on cows of mixed breeding; there is now ample data in this State to verify this estimate. In fact, it is considered by some that in this respect they have no rival where dairy qualifications are sought.

The progeny of the Guernsey when crossed on common cattle do not exhibit such objectionable colours as Jersey crosses, and they are also larger framed and more valuable for beef.

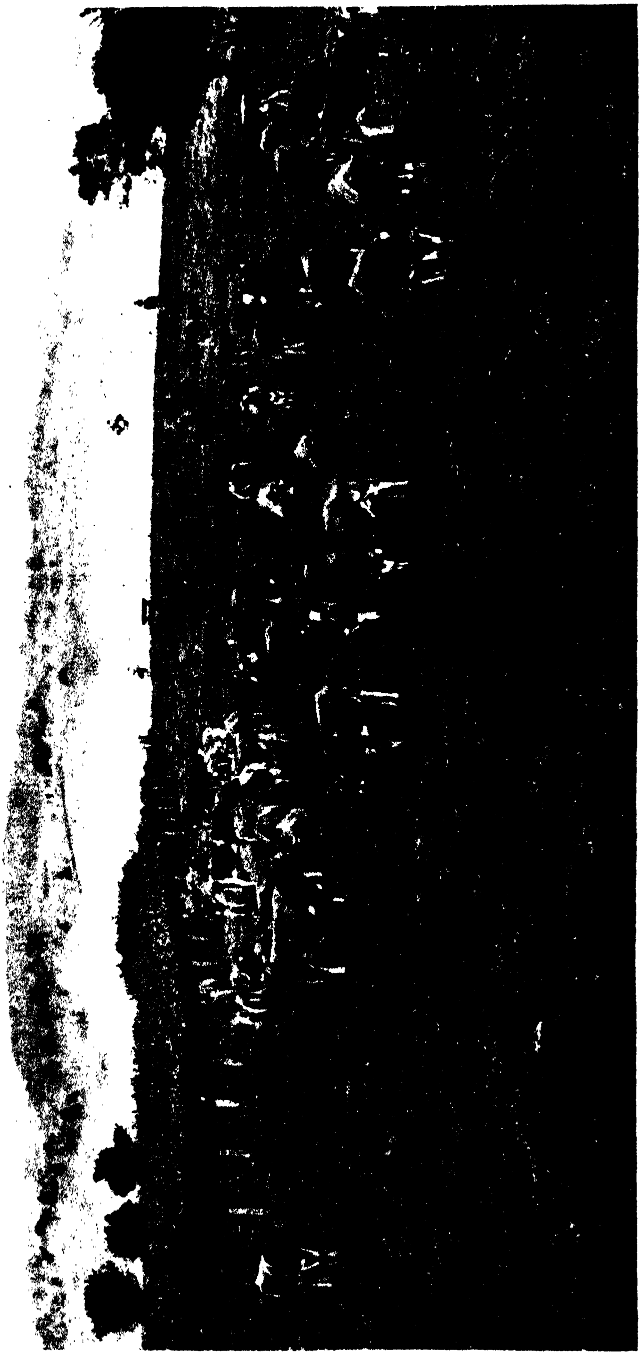
The whole of the herd at Wollongbar is tested once a month, under the United Pure-bred Cattle Breeders' Association. Once a cow has qualified and proved herself a first-class animal, no further efforts are made to stimulate milk yields, and her functions are for the future directed more to producing progeny of strong and vigorous constitution.

The milk and butter records of forty-nine of the Guernsey herd are given in the table, anent which the remark may be made that the results have been obtained without any forced feeding.

MILK Yields of Guernsey Cows at Wollongbar Experiment Farm.

Name of Cow.	Total Milk.	Test.	Total Butter.	Period.	Remarks.
	lb.	per cent.	lb.	Days.	
*Rosey VIII	7,732	4·5	409	303	Dam of King of the Roses, who sired George III.
*Parsons' Red Rose I (imp.)	6,999	5·5	452	357	Dam of Parsons' Red Rose III and IV.
Bel Air VI (imp.)	6,818	5·2	411	322	Dam of Bel Heiress.
Flower of the Preel (imp.)...	6,137	4·6	332	280	
Desdemona VIII (imp.) ...	6,721	4·3	340	259	
Beechwood Pearl (imp.) ...	5,547	5·0	327	280	

* Illustrated.



Group of Guernsey Cows at the Farm.

GUERNSEYS AT WOLLONGBAR EXPERIMENT FARM.

Milk Yields of Guernsey Cows—*continued.*

Name of Cow.	Total Yield.	Test.	Total Butter.	Period.	Remarks.
	lb.	per cent.	lb.	Days.	
Vivid (imp.)	7,985	...	459	371	Dam of Rose Vivid.
Rose Vivid	6,617	5·2	406	420	Dam of Rose Vivid II.
Vivid II	4,630	...	333	273	
Rose Vivid II	4,105	4·95	238·08	273	2-year-old.
Bel Heiress	6,407	5·1	385	350	First calf.
Bel Air III	4,994	...	298	273	3-year-old, 1st calf.
Psyche	4,639	...	265·27	273	3-year-old, ex Bel Air VI.
Princess Vivid	6,229	4·6	337	406	Ex Vivid II.
Lucino	5,101	...	290·29	365	2-year-old.
Angel Vivid	5,093	...	318	252	Dam of Lucino.
Saucy Rose	6,810	4·5	360	Milking period.	First calf.
Rohais Lassie II (imp.)	4,540	...	240	Milking period.	First calf.
” ”	5,332	...	292·07	273	Second calf.
Lass of Berry	4,438	...	282·47	273	3-year-old.
*Parsons' Red Rose II (imp.)	8,865	...	655·65	365	Dam of Parsons' Red Rose V.
Parsons' Red Rose III	4,232	...	243·13	273	2-year-old.
*Parsons' Red Rose IV	5,448	...	337·26	273	3-year-old.
*Parsons' Red Rose V	3,793	...	272·43	273	2-year-old.
Parsons' Promise	5,178	5·63	334·53	333	3-year-old. By Parsons' Hope.
Beatrice XIV (imp.)	6,791	...	400	350	Dam of Beatrice.
*Beatrice of Berry	5,566	5·5	362	Milking period.	On first calf.
Gertrude	5,991	...	351·69	273	
*Anna	4,509	...	333·97	273	
Jasmine of Wollongbar	6,995·5	...	378·38	243	Grand dam of First Kiss
Princess Jasmine of Wollongbar.	5,205	...	308·87	273	Ex Jasmine of Wollongbar.
Princess Jasmine II	4,146	...	212·85	273	2-year-old.
First Kiss	5,323	...	316	273	2-year-old.
Parsons' Promise II	3,820·5	...	231·72	273	2-year-old.
Annetta	4,501	...	291	273	3-year-old, ex Anna.
Desdemona of Wollongbar	3,858	...	247·08	273	2-year-old.
Rosey of Wollongbar	4,980	...	344	280	Dam of Rosey III.
Rosey III of Wollongbar	3,565·5	...	227·97	273	2-year-old.
Faith	3,894	...	246·33	213	Only two teats, after rearing four calves in succession.
Hope	3,625·5	...	231·81	273	2-year-old.
Leonie of Wollongbar	4,167·5	...	258·76	273	3-year-old.
Princess May	6,811	5·1	410	Milking period.	Dam of Queen of the May.
Queen of the May	5,146	...	283·74	273	3-year-old.
Calm II	7,548	...	503	287	Dam of George III.
Shamrock of Wollongbar	3,325	...	199·77	273	2-year-old.
Paris	5,049	...	303·78	273	4-year-old.
Village Princess	4,275	...	277·56	273	3-year-old, ex Princess Vivid.
Golden Girl of Wollongbar	3,960	...	247·38	243	3-year-old.
Royal Souvenir	4,463	...	279·15	273	3-year old.
Souvenir (imp.)	4,943	4·9	331	Milking period.	3-year-old.

* Illustrated.

Parsons' Red Rose II (imp.) (189 A.G.H.B.).

Yield, 8,865 lb. milk and 655·65 lb. butter in 365 days.

Parsons' Red Rose V (Vol. II, A.G.H.B.).

By Hayes' Fido (imp.) (24 A.G.H.B.), ex Parson's Red Rose II (imp.) (189 A.G.H.B.).

Yield, 3,798 lb. milk and 272·43 lb. butter in 273 days as a 2-year-old.

GUERNSEYS AT WOLLONGBAR EXPERIMENT FARM.

The total yield from the herd at Wollongbar is given in the next table, but in presenting these figures it should be stated that the chief function of the herd is to produce stud stock, and a number of aged cows are retained for breeding purposes whose yields lower the average per head. The increase of the popularity of the herd is indicated by the fact that during the last year bulls were sold to the total value of £815.

TOTAL yield of Dairy Produce for year 1916–17.

Average number of cows milking	68
Total amount of milk produced	28,858 gals.
Amount of milk separated	17,561 „
Amount of milk used for cheese-making	5,409 „
Whole milk used on farm	5,888 „
Skim-milk supplied to calves and pigs	15,750 „
Whey supplied to pigs	3,864 „

	£	s.	d.
Butter, cash sales (9,987 lb.)	605	10	7
Cheese, cash sales (4,583 lb)	184	6	5
Value of whole milk used on farm (at 8d. gal.)	196	5	4
Value of skim-milk fed to calves and pigs (at 1½d. gal.)	98	8	8
Value of whey fed to pigs (at 1d. gal.)	16	2	0
Total value dairy produce	£1,100	13	0
Average return per cow for 68 cows milking	£16	3	0

Cows Illustrated.

Parsons' Red Rose II (imp.) (139 A.G.H.B.) was bred by Mr. A. Toogood Parsons, King's Mill, Castel, Guernsey, and is now 11 years old. She is out of Parsons' Red Rose (2813 F.S., R.G.A.S.) by Gil Blas, ex Dairy III. In conformation this cow does not, perhaps, present show lines. Nevertheless, she is of decided dairy type, and her performance of 655·65 lb. butter in 365 days entitles her to first rank. There is probably no better Guernsey cow in Australia, and we now have four female descendants from her that are good enough to form the foundation of a fine Guernsey stud.

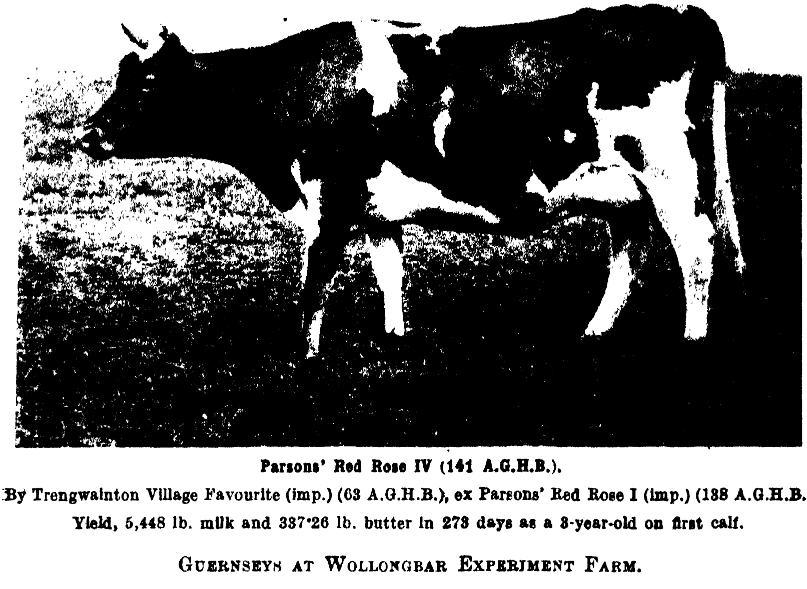
Parsons' Red Rose V (Vol. II, A.G.H.B.), a 3-year-old daughter of the above, has just completed her first milking period for 272·43 lb. butter. She was sired by Hayes' Fido (imp.), and promises to even outrival her dam.

Parsons' Red Rose I (imp.) (138 A.G.H.B.), now 13 years old, was bred by Mr. Parsons, Guernsey, and is out of the same cow as Parsons' Red Rose II, but by a different bull, viz., Roberts' Success (1239 P.S., R.G.A.S.). Her best performance was 452 lb. butter in 357 days. Her last calf (a bull) was dropped in 1916. He is a fine type of animal and worth 100 guineas.

Parsons' Red Rose IV (141 A.G.H.B.) on her first calf produced 5,448 lb. milk, which tested 5·3 per cent., yielding 337·26 lb. butter in 273 days. She is out of Parsons' Red Rose I (imp.), by Trengwainton Village Favourite (imp.), ex Mild Eyes. This is another cow of great capacity, which inherits her dam's qualities.

Parsons' Red Rose I (imp.) (138 A.G.H.B.).

Yield, 6,999 lb. milk and 452 lb. butter in 357 days.



Parsons' Red Rose IV (141 A.G.H.B.).

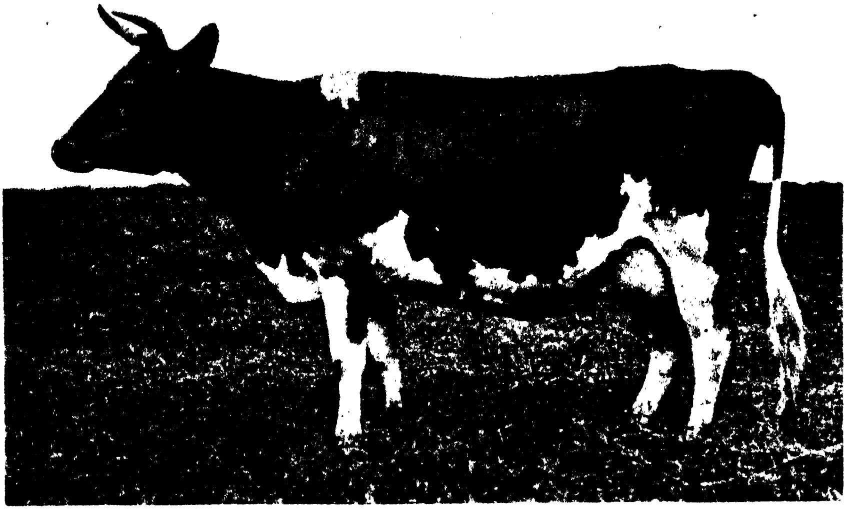
By Trengwainton Village Favourite (imp.) (63 A.G.H.B.), ex Parsons' Red Rose I (imp.) (138 A.G.H.B.).

Yield, 5,448 lb. milk and 337·26 lb. butter in 273 days as a 3-year-old on first calf.

GUERNSEYS AT WOLLONGBAR EXPERIMENT FARM.

Beatrice of Berry (8 A.G.H.B.) was dropped in 1908. She is out of Beatrix XIV (imp.) by Royal Blood VI. Her sire is Calm Prince, ex Gentle (imp.) by Rose Prince. On her first calf she produced 362 lb. butter, and in type she is fit to grace any stud.

Anna (7 A.G.H.B.) is a descendant of one of the first importations (Souvenir). She is out of Keepsake by Vivid's Prince, ex Souvenir by Peter (imp.). Sire, Royal Preel of Wollongbar (imp.), ex Hayes' Lily du Preel IV (imp.). She is a cow of wonderful dairy conformation and strong constitution. At Grafton, on her first calf, she produced 375 lb. butter. Her last bull calf is now under offer for 100 guineas. Her daughter, Annetta, completed her test with 291 lb. butter in 273 days on her second calf.



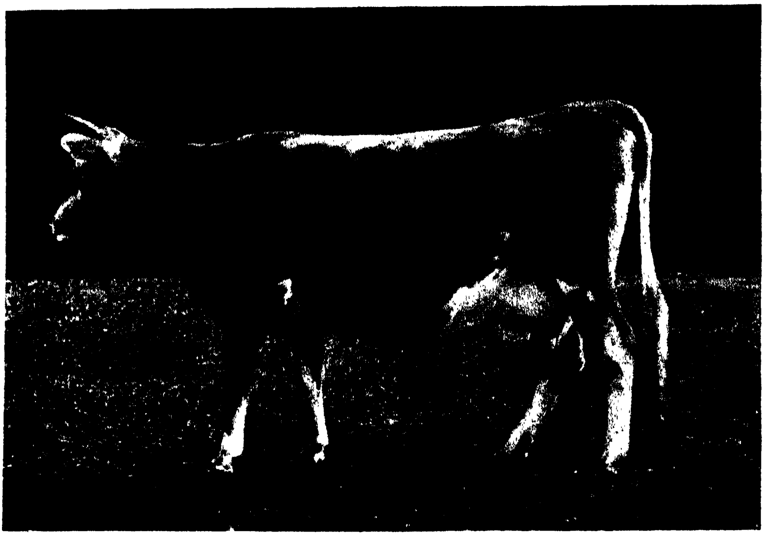
Beatrice of Berry (8 A.G.H.B.).

Yield, 5,566 lb. milk and 362 lb. butter in milking period on first calf.

Rosey VIII (imp.) (172 A.G.H.B.) was bred by the Hon. J. E. Ellis, M.P., Selby, Yorkshire, and is now 12 years old. She is from Rosey III, by Waldo ex Rosey II; sire, Broomflower II ex Rose Briar. Her best yield was 409 lb. butter in 303 days.

Other Good Cows.

Desdemona VIII (imp.) was bred by Mr. J. Le Page, Hill Farm, St. Andrews, Guernsey, and is now 11 years old, but she is still a great producer. Unfortunately, she sustained an injury when coming out from Great Britain, and another when she was on her way to Ballina. She is of extreme dairy type, and the head and neck are of ideal Guernsey character. Her best yield was 340 lb. butter in 259 days. A young bull from her was this year sold to the New Zealand Government for 60 guineas. Her daughter, Desdemona of Wollongbar, produced 247·08 lb. butter in 273 days on her first calf.



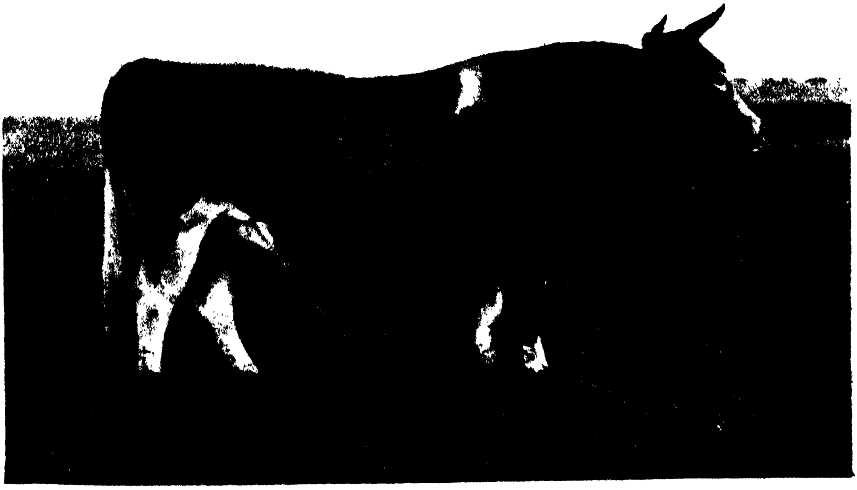
Anna (7 A.G.H.B.).
Yielded on her first calf 375 lb. butter.

Rosey VIII (imp.) (172 A.G.H.B.).
Grand dam of stud bull George III (15 A.G.H.B.).
Yield, 7,732 lb. milk and 409 lb. butter in ten months.

GUERNSEYS AT WOLLONGBAR EXPERIMENT FARM.

Godolphin Moses (imp.) (16 A.G.H.B.).

By Golden Hero of the Vauxbelets (1929 E.G.H.B.) from Rosetta (6509 E.G.H.B.).



George III (15 A.G.H.B.).

By King of the Roses (imp.) (29 A.G.H.B.), ex Calm II (23 A.G.H.B.).

Yield of dam, 7,548 lb. milk and 503 lb. butter in 287 days.

GUERNSEYS AT WOLLONGBAR EXPERIMENT FARM.

Princess Jasmine of Wollongbar is from Jasmine of Wollongbar (imp.) by Orphan Lad (1603 E.G.H.B.); sire, Prince Souvia, ex Souvenir (imp.) by Vivid's Prince. This is another fine, strongly constitutioned animal. Her best yield was 308·87 lb. butter in 273 days. In March last she produced 1,054 lb. milk, testing 6·4 per cent., equal to 83·39 lb. butter. for the month.

The Stud Bulls.

The pedigrees of the stud bulls in use at Wollongbar are as follows :—

The Peacemaker, dropped 1909; dam, Rose Peterson, ex Rose Petal by Peter (imp.); sire, Calm Prince, ex Gentle (imp.) by Rose Prince (imp.). In colour this bull is a rich orange. He is of a fine type, has a vigorous constitution, and is of a splendid temperament. Incorporated in him he has the best strains of blood imported. His stock are quite coming up to expectations.

George III, dropped 1911; dam, Calm II, ex Gentle by Rose Prince; sire, King of the Roses (imp.), ex Rosey VIII (imp.) by Hayes' King. His breeding and general appearance entitle him to the first rank amongst our best sires, and he has already shown that he has the power to transmit his good qualities.

Godolphin Moses (imp.) (16 A.G.H.B.) is by Golden Hero of the Vauxbelets (1929 E.G.H.B.) from Rosetta (6509 E.G.H.B.). He was bred by Mr. W. T. Richards, Godolphin, Breaze, Cornwall.

WEEDS AS ENEMIES OF FOREST TREES.

RECENTLY Mr. F. G. McPherson, the District Forester at Wyong, sent a specimen of the Native Pea plant, with dull red blossoms, known as *Kennedya rubicunda* Vent. It is extremely common in the coastal districts of New South Wales, and his communication included the following passage :—

> This vine is superabundant at present throughout the forests in this district, especially on areas which have been improved, where they attack and cover up the young hardwood trees in a very short space of time. I know areas where reafforestation is good and young trees up to from 2 to 5 feet high are plentiful, but they are all hidden from view by this vine. I am afraid it will menace the forests by retarding the growth of the young trees.

The matter thus brought under notice has been rarely dealt with in Australian forestry. I have a few paragraphs on the subject at page 227 of Part 58 of "Forest Flora of New South Wales."

The answer that I gave was as follows :—

> A native of Australia. In open sandstone country it is usually a trailer, but in the scrub it is a vigorous climber. The point you raise is a very interesting one; there is, in effect, a struggle going on between the vine and the young trees. Probably it would not pay for the forester to interfere with the struggle in most cases. But I expect that, in the vast majority of cases, the young trees will shoot up and leave the humbler vine, the leaves of which may have some manurial value for the forest.
>
> Firing the land very much helps the dissemination of a vine like this, as it burns off its enemies and facilitates the germination of the seed of the vine.

The subject becomes important in view of the increased scientific attention our forests are claiming, for as settlement increases we shall find that our hitherto primeval forests will become more and more attacked by both native and exotic weeds. I am sure that if the subject be ventilated nothing but good can result.—J. H. MAIDEN.

Popular Descriptions of Grasses.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

The Phalaris Grasses.

THE principal Phalaris grasses growing in New South Wales are *Phalaris canariensis, Phalaris minor*, and *Phalaris bulbosa*. The first two are annual introduced grasses, and are found growing wild in many parts of the State during the winter and spring. They are both known under the name of Wild Canary grass. *Phalaris minor* is often, and *P. canariensis* sometimes mistaken for the perennial, *Phalaris bulbosa*. The corresponding parts in Figs. 1 and 2 render the distinctions clear. It will be noticed that the head of *Phalaris minor* is much shorter than that of *Phalaris bulbosa*, and the root system simply fibrous, and not stoloniferous. The habit of *Phalaris minor* is annual, that of *P. bulbosa* perennial, while the former is a heavy and the latter a shy, seed-bearer.

Phalaris canariensis is even shorter in the head than *P. minor*, and also much wider. The flower scales are oval and handsomely marked with yellowish-green and white stripes.

The wild canary grasses are excellent fodder plants. The foliage and stems are soft and succulent. If grazed they stool considerably, and provide pasture well into November. Owing to the harmless nature of their seed heads and their lessened capacity for crowding out other fodder plants, they are much to be preferred to barley grass.

Phalaris bulbosa, although comparatively new to New South Wales, is increasing considerably in importance, and at the present time several pastures of this grass can be found throughout the State.

Phalaris bulbosa comes from the Mediterranean regions of Europe, and was first favourably reported on in the *Agricultural Gazette* in 1908. It thrives best on the coast, tablelands, and slopes. It has been proved at Wagga Experiment Farm to endure dry conditions remarkably well. The root is perennial, with long fibrous rootlets, in most cases invested with a woolly covering. The surface roots are slightly creeping underground. The leaves are broad, light green in colour, and very succulent. If stocked heavily it forms a close turf.

In a test carried out at Glen Innes Experiment Farm the palatability of the grass was proved to be greater than that of rye, cocksfoot, and most English grasses. It makes excellent hay, but should be cut as soon as the flower-heads begin to peep. That it will stand a considerable amount of pasturing has been shown by trials at Glen Innes and Wollongbar Experiment Farms. The continually stocked pasture at Glen Innes is now 4 years old and that at Wollongbar 3 years old, with a fine turf of the grass still remaining.

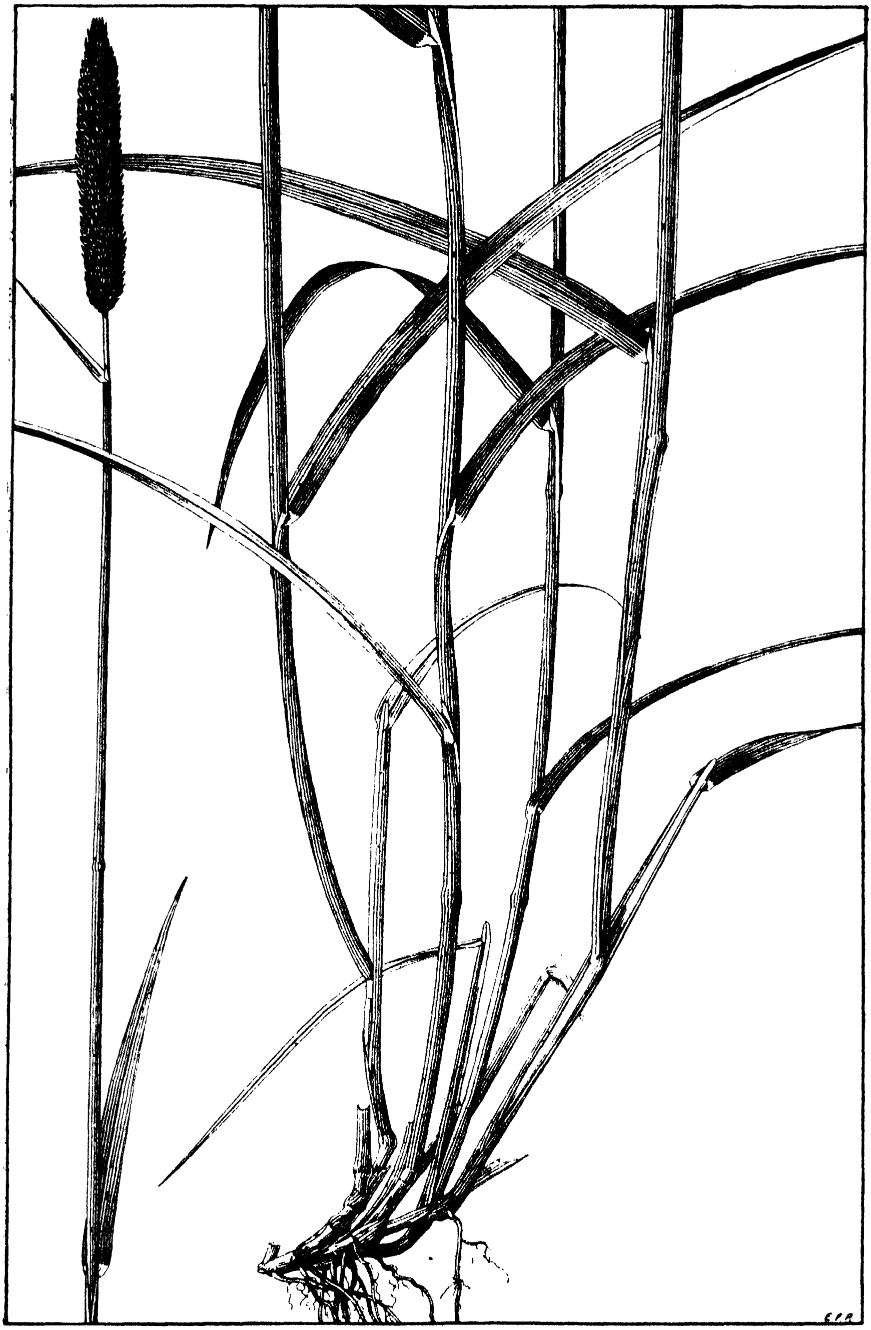


Fig. 1.—*Phalaris bulbosa.*
Note the stoloniferous root system and long seed head.

POPULAR DESCRIPTIONS OF GRASSES.

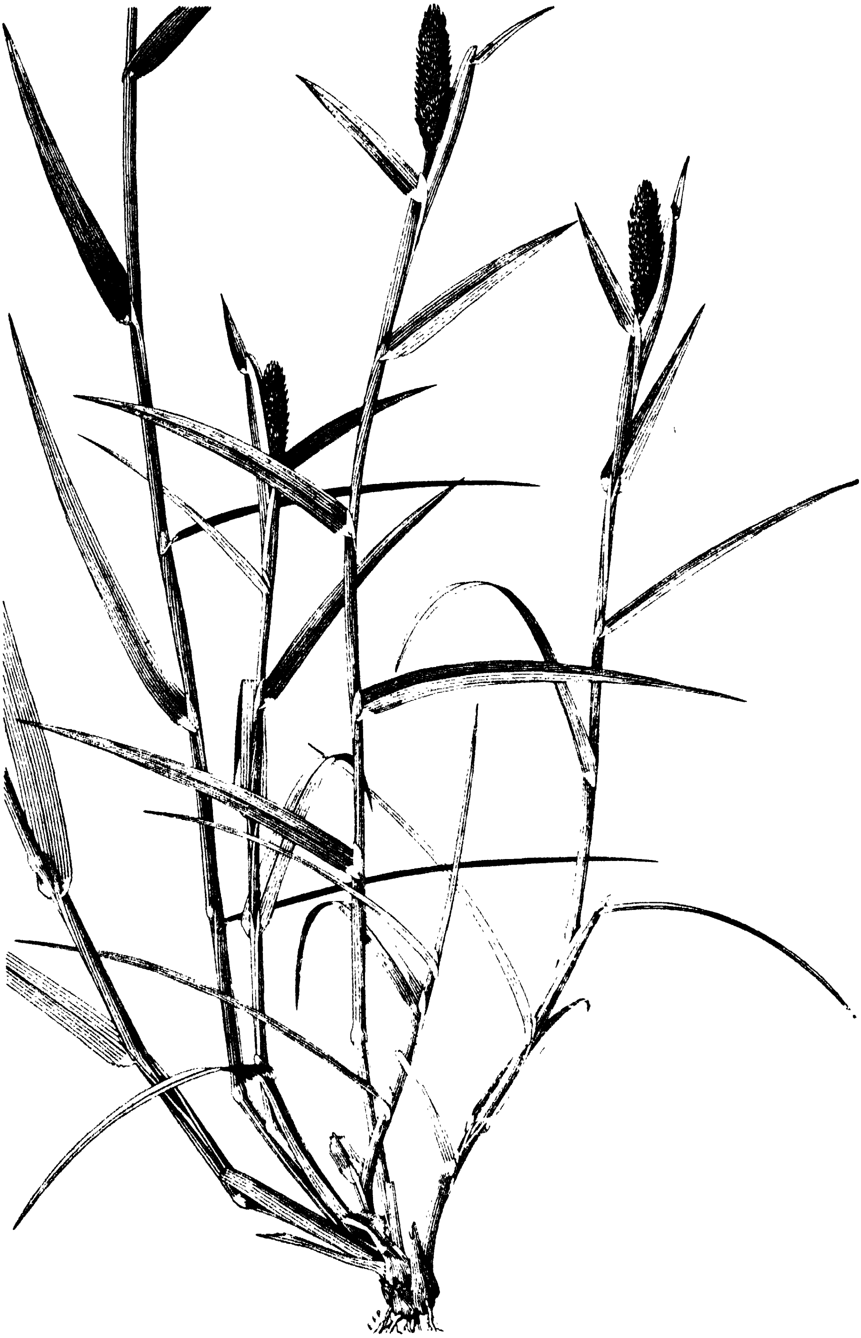


Fig. 2.—**Wild Canary Grass** (*Phalaris minor*).
Note the fibrous root system and short seed head.

Amongst the big growers of this grass is Mr. Simpson, of Stonehenge, who prefers it to all other grasses.

The seed should be sown in the autumn at the rate of 8 lb. per acre; drill or broadcoast sowing is optional. Care should be taken to have the right seed, which is very hard to distinguish from that of the annual *Phalaris minor.* The integrity of the seedsman has to be relied upon in a case of this kind. Good seed can be obtained at 2s. 6d. per lb.

By sowing in autumn the grass is able to obtain a good start before the very cold weather sets in. It is not injured by even severe frosts, but its growth is somewhat checked until the arrival of warm conditions. The grass should not be heavily stocked during the first year, thus enabling the plants to stool and form a turf. When established the grass can be very closely grazed by sheep, resulting in a close turf which is generally effective in crowding out weeds.

A NEW GARDEN ESCAPE.

IN the *Queensland Agricultural Journal* for July, p. 36, Mr. C. T. White, the Acting Government Botanist, says that he looks upon the Cape Ivy as *Senecio tamoides.* Now, the Cape Ivy of New South Wales, which is a great curse in our coastal districts, is *Senecio mikanioides,* and it is called *S. scandens* by some authors. It is a climbing-like plant introduced from South Africa, has yellow flowers, and leaves which remind the ordinary citizen of ivy. It not only scrambles over the rocks, but covers vegetation with a tangled or smothering mass, in the coastal districts.

It is somewhat singular that the *Queensland Agricultural Journal* for July, and Mr. H. V. Jackson, of Narrabeen, near Sydney, arrived in my office at the same time. Mr. Jackson brought with him the first specimens of *Senecio tamoides* I have seen in Australia. They have been growing in his garden, which is at the seaside, and he finds it very useful, because it will grow in the poorest saline, sandy soils, exposed to stiff nor'easters.

So far as he knows, it has not displayed any tendency to get out of bounds. He obtained his original plant from the Sydney district, and how that plant came into New South Wales is not known. Up to date I have not received it from any other part of New South Wales, although I have been on the look out for it.

It belongs to a group of plants, some of which are quite harmless, so far as we know, but others are harmful to stock. As we keep a very careful record of the weeds that are found in New South Wales, I take the opportunity of inviting correspondents to view with suspicion any plant that comes newly into their district, until such time as they are assured that it is harmless.—J. H. MAIDEN.

Nature Study with Wheat.

J. T. PRIDHAM, Plant Breeder.

THESE notes have been prepared on the lines followed by Mr. Wenholz in this *Gazette* with respect to maize. It is hoped that boys in the wheat-growing districts may be led to find more interest and profit in farming pursuits, which are so commonly associated with long hours of drudgery. It is usual for a farmer to give his boy a foal, a steer, or a few sheep, in order to sustain his interest in the farm; while in other cases a lad may have a piece of ground to grow vegetables, which he sells to the family. In these cases, however, the element of competition and rivalry is wanting.

With regard to school gardens or boys' competitions in connection with Agricultural Shows, the suggestion is made that in the first case the rows in the school garden be short and of equal length, each boy competing having a single row. The series of rows should be repeated as often as the extent of ground will permit, and an average yield arrived at for the plots of each competitor. If wheat is grown in the same way as peas or beans (*i.e.*, sowing single grains), the most inexperienced will soon betray a new interest in the crop. Sowing the seed in this way gives an opportunity for observation and detecting differences that would escape notice in the field crop. The habit of growth and the merits or defects of individual plants can be seen. A certain weakness is often associated with a particular type of foliage, so that a plant may be put down as susceptible even though the conditions causing the weakness or disease in question may not be present.

For Show competitions the plots could be larger, but of uniform size, and the prize awarded according to the condition of the sample of grain as well as the yield per acre. The result might well be that the treatment given to a plot for Show Exhibition would be extended in degree to the farm crops, and the methods of cultivation and seed selection of the whole district improved.

The Grain.

The seed of wheat consists of three parts—the embryo, the endosperm, and the outer coats or bran.

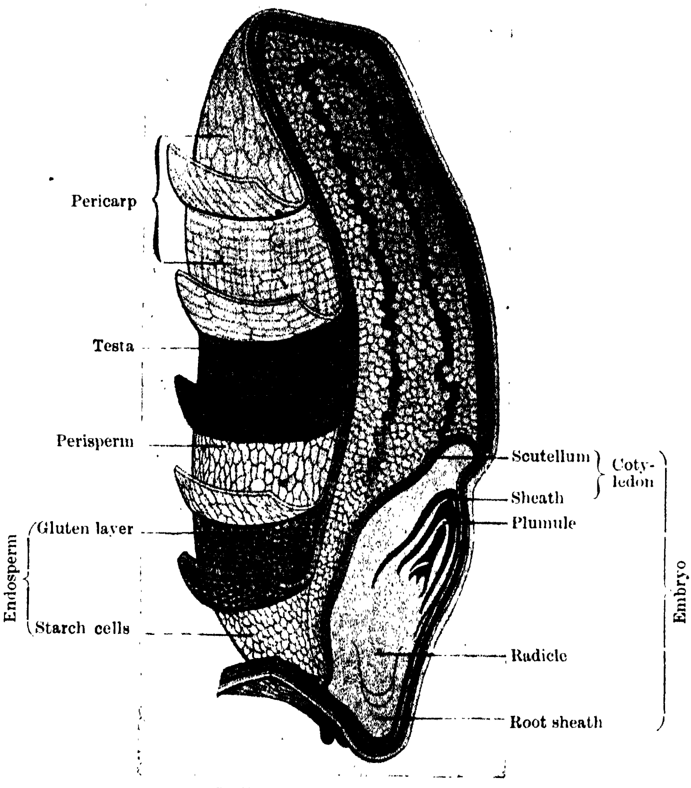
1. The ***Crease*** is the depression running from the embryo or germ to the brush at the opposite end of the grain. When seed is shrivelled from drought or rust the crease is deep and wide. Varieties also differ in the depth and width of the crease even when the sample is well grown.

2. The ***Brush*** at the end of the grain furthest from the ground in the ear of the growing plant is a collection of hairs or bristles which prevent rain from damaging the grain.

3. The outer seed coat is known as the ***Pericarp,*** and is composed of three colourless layers. These are largely removed, together with the brush, when grain is being cleaned for milling.

4. The next layer is the ***Testa,*** which contains most of the colouring matter of the grain, determining whether it is to be known as a white or red grained variety.

5. Next comes the ***Tegmen,*** a single layer of cells overlying the aleurone or gluten cells.



Section of Wheat Grain.

6. The ***Aleurone layer*** encloses the endosperm and embryo completely, so that the contents of the grain are well protected. These four layers together constitute the bran, which forms 13 per cent. of the grain.

7. The ***Embryo*** or germ contains the cotyledon, a protective sheath enveloping the plumule or young shoot. The radicle, or rudimentary root, lies in the embryo opposite the plumule.

8. The ***Scutellum*** is a layer between the embryo and endosperm containing certain ferments which dissolve the starch and gluten of the grain into sugary forms which the sprouting grain can assimilate in the first stages of growth.

9. The ***Endosperm*** consists of at least thirteen-fourteenths of the space in the grain, and is made up of starch and gluten stored up to feed the young plant before its roots become established in the soil. The starch cells are of different sizes, and through these runs a strip of gluten cells. The bulk of the gluten of the grain lies in these, and in the cells of the aleurone layer; but in the latter the gluten is of inferior quality for bread-making to the gluten distributed among the starch cells.

10. *Quality of grain.*—This can only be accurately gauged by a milling and baking test; but a simple and fairly reliable guide is afforded by chewing a few grains after breaking them up with a hammer. If the gluten is springy and elastic the flour is likely to be satisfactory with the baker. But if it is soft and inelastic it is a sign of weak flour.

11. *Hardness.*—Millers dislike a very hard grain; at the same time the very soft kernels are usually poor in gluten.

Germination.

1. *Plate tests.*—Spread a given number of grains on damp blotting paper or flannel on a plate, and note the number which germinate each day up to ten days.

2. *Field tests.*—Plant a given number of seeds at a uniform depth in rows at equal distances apart, and note the numbers germinating as before.

3. *Hindrances to germination.*—Where blanks occur in the field tests uncover the surface crust carefully and note the condition of the young shoot.

4. Where plants have appeared above ground and then died off, look at the roots or base of stem for *insect attack.*

5. Note whether a backward seedling catches up to the others or whether it remains weak, showing *inferior vigour.*

6. Remark whether the plants are all equally *prostrate or erect* in habit: the latter are usually early in ripening.

7. Note the *degree of stooling,* which is best seen before the plants begin to run up.

Roots.

1. Dig up a young plant carefully and wash away the soil from it. Notice the tiny *primary roots* round the seed and compare with the numerous *secondary roots* issuing from the underground stem between the seed and the surface soil.

2. Plants seeds at *different depths* and note the effect on the development of roots and the vigour of the plant above ground.

3. Place a little *superphosphate* between the rows of wheat and also immediately round the seed when sowing, working it into the soil in both cases. When the plants are 12 or 18 inches high, compare the root systems in each case, also when no fertiliser is used.

4. Dig up a sick or weakly plant and compare the roots with those of a healthy plant.

5. It has been found that the active or *functional* area of the root system is an indication of drought resistance, rather than the mere length and vigour of roots formed by a variety.

Stooling or Tillering.

1. Buds are formed where the lower nodes or knots are covered with soil and these start into growth, each forming a *stool or tiller*: Note that the upper nodes do not give rise to branches as in most plants.

2. Sow the same variety of wheat (*a*) *early* and (*b*) *late* in the season, and note the difference in the number of stools produced in either case.

3. Sow two adjacent plots of a given variety on the same date and cut back one to represent *feeding off with sheep*, leaving the other untouched. Note the number of stools ultimately formed and the yield of grain in each case.

4. Note the difference in yield between plots cut back when 4 inches high and 12 inches high.

5. Note whether the greater number of stools of a thinly-sown plot makes up in yield for the fewer plants grown.

6. Compare the yield of a rather heavy stooler like Cleveland with a sparse stooler such as Firbank.

6. Note the *optimum degree of stooling* for the district: this varies with the season, but it will be found that excessive stooling is not desirable.

7. Observe the *difference in stooling* on various classes of soil with the same variety of wheat.

Leaves and Straw.

1. Note the *breadth of the leaves* when the plants begin to come into ear.

2. Remark the *limpness or stiffness* of the leaves at this stage; also their colour, whether pale-green or dark-bluish green.

3. How do the leaves act in hot weather to lessen evaporation from their surface?

4. Take a few stalks when 6 inches and 12 inches long and slit them up the centre with a sharp knife: the embryo ear may be seen and the spikelets counted.

5. At what height may the crop be eaten off or cut down without removing the rudimentary ear in so doing, thus entailing the production of a fresh shoot from the base?

6. What character of foliage seems to be associated with *drought resistance?*

7. What class of plant appears most subject to *rust?*

8. Distinguish between the different *characters of straw.* Some plants have short, thin-walled, brittle straw and yet stand well enough to be harvested. Others have slender but apparently tough straw, which leans over from the weight of the ears and becomes lodged. Another kind is slender but supple, and able to recover itself after lodging.

9. Note the marked *weakness of straw* of an early ripening variety when sown early—out of its proper season.

10. What is the *difference in height* of plants of the same variety sown early and late?

11. Note the *difference in the amount and character of foliage* when the same variety is sown on two widely different soils.

12. Note the *characters of a good hay wheat*—a sufficiently bulky and abundant growth, with a deep green colour to the foot of the straw, which is tall and not coarse, showing a minimum of dead flag.

13. Note the *palatability* to horses of straw cut at different stages of ripeness; when all the nutritive matter is in the stalk and leaf, up to the time when it becomes transferred to the grain.

14. As the crop ripens note whether winds cause the straw to break down or the heads to snap off.

15. Note the remarkable number of stools often developed by a plant having plenty of space or unusually favourable environment, and do not conclude that it is necessarily a good plant from which to save seed, for it may not reach even normal development when given the same conditions as ordinary plants.

The Ear.

1. Compare the *number of grains* produced on the average by a broad club-shaped ear and a cigar-shaped or tapering ear.

2. Do the *glumes or chaff of the ear* open to such an extent that the grain becomes easily bleached by rain or allowed to shatter?

3. Has the Federation variety an undue proportion of *low ears on short stalks* as compared with other varieties?

4. Count the average number of *sterile spikelets* at the base of the ear in different varieties.

5. Note the *degree of withering* at the tip of the ear with different wheats, and determine whether it is due to the effect of frost and cold winds, or by drought or deficiency of soil moisture.

6. Count the average number of *grains per spikelet.*

7. Count the average number of *grains per ear* for different varieties or selections grown under uniform conditions.

Fertilisation.

1. When the wheat plants have been out in ear for a few days, in favourable weather they will begin to flower, and the tiny anther sacs may be seen fluttering in the breeze, attached by a delicate thread to the flower. Examine the ears a week or so after this and see if the *grain is forming.* Excessive rain, cold or heat about this time may prevent fertilisation, in which case the crop should not be left for grain.

2. Examine a plot which has been sown early, and if the percentage of grains found in the ear is low from the *effects of frost or cold winds* it should be cut for hay.

Ripening.

1. Dig up mature plants of different varieties without undue injury to the roots, which should be washed free from soil. When dry weigh the plants separately, and then the grain after threshing, to determine the *proportion of grain to total weight.*

2. Compare the *quality of the grain* when (*a*) the plot is watered two or three times after coming into ear, and (*b*) when water is withheld.

3. Determine the *average weight of grain* produced per plant: this will be a true guide to the relative productiveness of varieties.

4. Count the *number of days* between flowering and ripening in the case of different wheats: the period should be short in hot districts.

5. Try the *effect on the germination and vigour* of grain harvested (*a*) when in the dough stage and (*b*) when dead ripe.

6. Are the *most vigorous and productive plants,* giving the highest yield of grain, early maturing or late?

Diseases.

1. Note the *effect on the grain* produced when the plant is (*a*) attacked by *rust* on the leaf only, and (*b*) attacked by rust on the bare stalk.

2. What class of plant is most liable to *mildew* (***Erysiphe***) as regards foliage?

3. Describe the appearance of leaves affected with *flag or leaf smut.*

4. Why is it more important to remove plants suffering from loose or flying smut from a plot than those affected with ball smut or bunt?

5. Can you detect a difference in the foliage colour and in the appearance of the ear of a plant affected with *bunt* from a healthy plant?

6. What are the indications of *Take-all* in wheat?

7. Distinguish between Take-all and the condition of a plant in waterlogged soil.

8. What is the effect of *aphis attack* ?

9. How do *wireworms, cockchafer beetle larvæ, army worms,* and *eelworms* attack wheat?

10. Describe the best way to deal with (*a*) *grain moth,* (*b*) *weevil.*

Cultivation.

1. Compare the effect on the growth of a plot left uncultivated after sowing with that of a plot whose encrusted surface is regularly broken up with a hoe after every rain.

2. Compare the effect on the growth of a given variety when (*a*) it is left uncultivated but weeds allowed to grow, with (*b*) a plot uncultivated but all weeds pulled up or scraped off with a sharp hoe.

3. Compare the growth in two plots of the same wheat, one of which has been compacted with a board to represent rolling and the other scarified with a long-toothed rake to answer to the operation of harrowing, no other treatment being given.

4. Remark the growth of a plot situated in a hollow or slight depression (at the bottom of a shallow furrow) as compared with one sown on a ridge or slight elevation. Note the difference in the germination and vigour due to the effects of drainage in the one case, and want of drainage in the other.

5. To what causes should we attribute the comparatively low percentage of germination common in field sowings?

6. How many grains go to the ounce in the case of the different varieties grown?

7. In sowing at a given rate of seed per acre, should the number of bushels used vary for different wheats on account of varying size of grain and different stooling capacity?

Conclusion.

These hints may be of use to school teachers in wheat-growing districts, and should suggest to thoughtful farmers and boys living on farms a reason for inferior yields which may not have occurred to them. The problems in farming are infinite, and an apparently trifling detail may give the key to improved methods. If a spirit of inquiry and interest is aroused among the boys, and competitions instituted for them at country shows, much will have been done to raise the standard of wheat farming.

PURE SEED MAIZE.

THE Department of Agriculture has a limited amount of pure *selected* seed maize for sale for the coming season, both for grain and fodder purposes, as follows:—

Variety.	Seed available at	Railway Station or Wharf.
Improved Yellow Dent	Grafton Experiment Farm ...	... Grafton.
*Leaming		
Red Hogan	Hawkesbury Agricultural College	... Richmond.
Boone County White... ...	Berry Experiment Farm ...	... Berry.
Early Yellow Dent	Glen Innes Farm	... Glen Innes.
Silvermine	Yanco Experiment Farm ...	... Yanco.
Hickory King	Emu Plains Irrigation Farm ..	... Emu Plains.
Funk's Yellow Dent	North Bangaroo Stud Farm ...	... Canowindra.
Reid's Yellow Dent ...	Department of Agriculture ...	.. Sydney.
Gold Standard Leaming		

* No seed of this variety can be supplied after the middle of October.

The price is 7s. 6d. per bushel f.o.r. or f.o.b. at the station or wharf mentioned. Bags 9d. each extra.

As the supply is limited, intending purchasers are recommended to apply at once direct to the respective Experiment Farms or to the Department of Agriculture, Sydney, but inquiry should be made to ascertain whether the required quantity is in stock before remittance is sent.

All orders should be accompanied by remittance, with exchange added for cheques.

Potato Breeding for Farmers.

J. T. PRIDHAM, Plant Breeder.

THE potato crop has been brought into prominence lately as a cheap and easily-grown source of food. It is amenable to methods of selecting, although little has been done yet in this direction. A correspondent states that he has improved a variety in yield and in table qualities; and in order that others may be induced to take up the matter, the following few notes are given.

The potato may be improved (1) by propagating from the true seed or potato " apple," or (2) by selection from the tubers.

The true seed is seldom formed in our climate, but in the colder districts it is more often met with. Crossing may be employed to raise new varieties; but the process of raising full-sized potatoes of superior quality from the apples is too slow and uncertain for farmers, for it takes from four to six seasons before one can determine whether or not the new variety is worth going on with. Mr. C. T. Musson, of Hawkesbury Agricultural College, has had experience of this, and he found that some of the tubers raised from true seed were of marketable size in the fourth crop (two crops a year). As he says, a sowing of fresh seed should be made every year, and the propagation kept up at the different stages, so that some commercial potatoes are produced each year. The material must be carried along for a number of years before one can tell whether a superior variety has been produced. Perhaps only one in a hundred will prove valuable, but it is work that is well worth while for those who have the time and patience for it.

The second method of selection, from tubers or sets, is easy to follow and increases the yield, though distinctly new sorts are of uncertain occurrence. Darwin notes that dahlias, which are also raised from tubers, vary much when propagated in a hot climate. Every eye on a potato has an individuality of its own. Mr. W. T. Swingle, the American authority on citrus fruit, has found that in budding nursery stock from a naval orange tree some buds give rise to a better quality of fruit than others, the various branches of the tree producing fruit of varying size, thickness of rind, and flavour. One would expect that one seedling orange tree would yield better fruit than another, but even the buds of a naval orange tree, which does not reproduce itself by seed, may be differentiated

The field is the place in which to begin selection of the potato, rather than the barn, and at digging time the produce of each set or hill should be turned over in a heap by itself. The experimenter is then in a position to see the heaviest yielding mother plants. Experiments indicate that medium-sized tubers give the best results for seed, and housekeepers object to very large potatoes for cooking. Besides, a large potato is often accompanied by a good many undersized, or "pig," potatoes. After deciding which are the best plants, the produce from each selected set or hill should be put in a separate package or paper bag, and the collection put away in a dry place.

At planting time either whole potatoes may be used, or preferably sets of uniform size with one large well-developed eye to each set, cutting out the smaller ones. The packages should contain the same number of sets and should have a distinguishing number or letter, so that the place and row where it is planted may be recorded in a notebook. Half the sets should be planted in each case, leaving the balance for a second or duplicate planting. This is advisable in consequence of the more or less uneven nature of any soil for experimental purposes. Cut sets should be rubbed in lime or ashes before planting. A few grains of wheat or barley may be dropped between each selection as a division or mark. At digging time differences will be seen between the progeny of some mother plants and others, though in many cases there will be apparent uniformity. Variation will be noticed during growth in the abundance and the colour of the foliage, and opportunity offers at this stage to select potato plants free from disease. Although less variation is seen with plants propagated by cuttings, buds and tubers than in those grown from seeds, yet there is variation, not only towards degeneration but in the direction of increased vigour. The time it would take to effect a marked improvement depends on the vigour of the variety taken in hand; but where no selection on proper lines has been pursued, a distinct improvement in yield should be obtained after a few seasons' work as outlined above.

At each harvest the balance of the breeding plots might be mixed and used to raise a bulk for the main crop. The process, however, has to be kept up each year, and the skill of the experimenter is seen in preserving his potato true to type and a consistent yielder. We cannot hope for a wonderful improvement all at once, for nature works by slow and gradual steps; but by taking advantage of the favourable variations that occur, one can permanently ameliorate the race. Suppose we had taken the six best yielding mother plots in the first year, and six plants from each, we should have thirty-six packages or selections for the second year's experiments. In the third and succeeding years the same process would be followed, the balance not required for the breeding plots being used to raise seed potatoes for the farm.

Mr. W. E. Imes, of Michigan, writing in the *American Agriculturist*, claims to have increased his crop by one-third to one-half by this method of selection, and his practice was not to rely only upon plant yields when dug, but to mark with a stake the most vigorous plants when the field crop was in full growth. It would be a good plan to supplement the breeding plots with additional plants in this way; a plant of exceptional vigour might be discovered in the field that would out-yield the stock already in hand. Mr. Imes says that when potatoes begin to "run out" the eyes invariably become smaller. A large well-developed eye is a good point in a tuber; for seed purposes he prefers potatoes with stem-end eyes that protrude.

At the Svalöf breeding station in Sweden, new varieties of the potato are bred from testing-out selections from field crops and farmers' samples, from the variations arising in the course of continuous hill selection, as well as from the more tedious method of crossing and propagation from true seed.

There is no need to discuss here methods of planting, cultivation, and marketing, but it may be said that with proper selection there is no need for a change of seed or for obtaining seed potatoes from another district, provided that the soil is maintained in good heart by rotation of crops, and that the climate is suitable for potato growing. If the farmer is situated in a warm, dry climate, the experience at Svalöf indicates that it would pay him to obtain seed at regular intervals from more favoured districts. Under suitable conditions of climate and soil, and with intelligent selection, a variety will never run out, but rather tend to improve up to its limit of development.

A start with potato-breeding on the above lines was made at Cowra, by Mr. G. L. Sutton, assisted by the writer, but the climate was rather too hot and dry for the crop, and the work was not continued.

TRIALS OF VELVET, JACK AND YOKOHAMA BEANS.

SEEDS of the above varieties of beans were sown at Wollongbar Experiment Farm on 28th December, 1916, and the results are deemed worthy of record.

The Velvet beans (*Stizolobium utile*) were planted in rows 3 feet apart, and the seeds 18 inches apart in the rows. The soil was the typical volcanic soil of the farm, and the growth was such as to suggest that this legume is highly adapted to the district. From the start the growth was rapid, and the vines presently completely covered the ground and formed a dense mass of foliage that proved very palatable to stock. Besides being valuable as a forage crop, this bean is a splendid soil renovator. The pods were harvested in June, and it is intended to sow the seed this year.

The Jack bean (*Canavalia ensiformis*) made good growth and produced a fair number of pods. Both foliage and seeds proved bitter in flavour, which no doubt explains why stock do not eat them. The bean has some value as a soil improver, but is not nearly equal to the Velvet bean or cowpea in that respect.

The seed of Yokohama bean failed to germinate.—A. H. HAYWOOD, Manager, Wollongbar Experiment Farm.

The Apparent Failure of Humogen.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S., Biologist.

HUMOGEN is the name given to a preparation of peat invented by Professor W. B. Bottomley, of King's College, London, for which a high manurial value has been claimed. The substance is prepared by neutralising the peat and then causing it to undergo bacterial decomposition up to a certain point, after which the mass is sterilised and inoculated with a culture of nitrogen-fixing organisms.

Claims of the most extensive kind have been made. Serious journals have printed statements to the effect that the use of humogen may be expected to "double the food production of the country"; some have gone even farther and have spoken of trebling it. For these reasons attention may be called to an article by Dr. E. J. Russell, Director of the Rothamsted Experiment Station, in the April number of the *Journal of the Board of Agriculture* (England).

When the basis of the various statements as to the extraordinary manurial value of humogen came to be examined it was found, says Dr. Russell, to be somewhat slender, and to consist mainly of testimonials, which, as every agricultural investigator is aware, always seem to be forthcoming whenever a new fertiliser is brought before the public. The trials made at the regular agricultural institutions had in the main given negative results, and there was practically no evidence of agricultural value to which exception could not be taken.

Experiments with humogen were therefore conducted at the Harper-Adams Agricultural College, and at the Rothamsted Experiment Station. Dr. Russell reports that the field experiments were uniformly negative. They show no special fertilising effect, and in the only cases where increases were produced they were no better than were obtained from untreated peat.*

Inasmuch as articles upon humogen have appeared in the press here, and there have been numerous inquiries as to its manurial effects, we would call special attention to the concluding paragraph, with which we are in hearty agreement:—

"*Summary.*—Summing up the results, we find no evidence that humogen possesses any special agricultural value. There is not the least indication that it is fifty times as effective as farmyard manure, to quote an often repeated statement, and there is nothing to show that it is any better than any other organic manure with the same content of nitrogen. It is offered at present at £5 per ton in 2-ton lots; our experiments give no reason for supposing that it is worth anything like so much.

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*It should be pointed out that on receipt of this report Professor Bottomley stated that, through an error, Dr. Russell had not been supplied with bacterial peat, to which Dr. Russell replied that Professor Bottomley, and the firms from whom the peat was purchased, all knew that it was for the purpose of these trials.

"This result is in entire disagreement with the claims made on behalf of humogen, and the question naturally arises: Are these claims wholly without foundation ?

"In endeavouring to arrive at a solution of this question, two circumstances must be taken into consideration :—(1) The fact that good results were undoubtedly obtained in pot experiments both at Kew and at Wisley; and (2) the evident variability in the composition of humogen.

"(1) The writer is quite prepared to believe that the horticulturists found humogen in the quantities used at Kew and at Wisley a valuable addition to the compost used for potting-up plants, but he is not prepared to say that humogen is any better than an equal amount of untreated peat in an equally fine state of division. Such finely divided organic matter will serve several useful purposes in pots, and when it forms 12 per cent. or more of the whole bulk it is present in sufficient amount to exert a useful effect.

"It is quite possible that heavy dressings would have good effects on poor soils deficient in organic matter, but they would have to be on a far larger scale than is possible at present prices.

"(2) The second point to which attention should be directed is the evident variability of the samples. The analysis published in 'The Spirit of the Soil,' by G. D. Knox (p. 86), for which Professor Bottomley accepts responsibility, claims :—

Percentage of total nitrogen in humogen ... ... 4·310 per cent.

Rothamsted analyses on the other hand show :—

	As sent out.	In dry matter.
Percentage of total nitrogen in Manchester humogen	0·570	1·29 per cent.
Percentage of total nitrogen in Entwistle humogen	0·431	1·32 ,,

"Here, of course, is an enormous discrepancy. The book seems to indicate that the 4·3 per cent. of nitrogen is contained in humogen as sent out, but even if this is presumed to be an error, and the figure is taken to represent the amount in the dry matter, it is still greatly in excess of anything we find. It must be supposed either that there has been an error in Professor Bottomley's analyses, or that the two samples of humogen sent to Rothamsted were considerably poorer than the earlier samples.

"Dr. Voelcker has also called attention to the variations in samples sent out; one examined by him containing 0·48 per cent. of soluble nitrogen, while another contained 0·08 per cent. only.

"This variability is, of course, highly unfortunate. It is possible that some samples have acted well in the field; it is certain that others have not. There is no definite evidence that 'bacterisation' really adds to the value of peat. In the writer's view, the wisest plan would be to concentrate on experimental work and stop all propagandist operations until some definite basis of incontrovertible fact has been attained. The latter point is still a long way off; the problem of utilising peat is sufficiently difficult to occupy the whole attention of a laboratory for some years, and nothing but quiet, serious work is likely to solve it."

Bokhara or Sweet Clover.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THIS is one of the best known cultivated plants in the United States of America, and it was owing to its remarkable success and popularity in that country that it was decided to give it a thorough trial at the experiment farms in New South Wales, Glen Innes and Yanco being chosen for the purpose.

Bokhara clover (*Melilotus alba*) is not a true clover, as the name would imply. It belongs to the same genus as the well-known Hexham scent (*Melilotus parviflora*). In the young stages its growth closely resembles that of lucerne, but as the plant develops the foliage becomes much denser, the leaves larger, and the plant has a darker colour than that of lucerne. It is of a biennial habit; that is, under ordinary conditions it does not set flowers or seeds until the second year, and then it dies. This is not a constant characteristic, however, as both at Glen Innes and Yanco flowering has taken place to a small extent during the first year, though the heaviest seeding occurred during the second year.

If allowed to develop its growth unchecked, the plant assumes a very woody and spindly character during the final stages of the second year. Long woody stems are sent out prior to the flowering period, on which develop numerous white flowers. It is the great abundance and particular character of these flowers that render Bokhara or Sweet Clover one of the best plants from the apiarist's point of view. The seed sets very slowly and very irregularly, which renders the harvesting a very difficult matter.

The success of Sweet Clover, where tried in this State, may be gathered from the following reports.

Trial at Glen Innes Experiment Farm.

Mr. G. Potts, lately Experimentalist at this farm wrote:—

"The seed was sown on the 10th September, 1915, in rows 2½ feet apart on $\frac{1}{10}$th of an acre. The germination was good, approximately 75 per cent. The plant soon developed a creeping habit, with a strong, lengthy root system, and a tap-root somewhat similar to lucerne. The foliage was very profuse. The plant made exceptionally good growth during the dry spring and summer. Although up to the date of this report it has not proved a tall grower, it is a profuse stooler, having as many as eleven stools to a plant, and measuring in many instances 3½ feet in length. The foliage is inclined to be bitter, and perhaps stock will need to acquire a taste for it. As an illustration of this, I put an armful of the plant near an Ayrshire bull, and, as a check, also placed a bundle of lucerne in the paddock. He tried the clover, but immediately went to the lucerne and started feeding. I then mixed the two together, but the animal picked out the lucerne and left the clover untouched. But for this, it is a very promising plant up to date, affording a large quantity of succulent fodder. It is worth noting that the spaces between the rows are completely filled owing to its strong stooling qualities."

It might be mentioned that, prior to sowing, the ground was a veritable breeding-ground for Barnyard grass—one of the worst weeds in New England. The clover succeeded in choking it out completely.

At a later stage (January, 1917) Mr. Potts reported :—

"The clover was cut to the ground by frost, and there was no growth until the spring. On the 20th November there was a very strong growth, 3 feet high. It commenced to flower on 15th December. On the 20th January it was 7 to 8 feet high and was setting seed very well. It stools very strongly, and while young spreads over the ground, producing a large amount of succulent fodder. The stems, however, become very woody, and, if to be used for grazing or for hay, it should be cut while still young. Horses, cattle and sheep will not eat it, largely on account of the bitter after-taste. It should prove useful as a rotation crop for green manure."

Trials at Yanco Experiment Farm.

At Yanco, seed obtained from Australian seedsmen and another lot obtained from America were sown. Mr. J. M. Pitt, Experimentalist, reported as follows :—

"The American variety has made much better growth than that supplied by the Australian seedsmen. For comparative purposes a row of each strain was cut and weighed on the 8th January, 1916. The yield from the American strain weighed 64 lb., and that from the local strain 10 lb. Since then the American strain has come away quickly, and attained a height almost equal to the first growth.

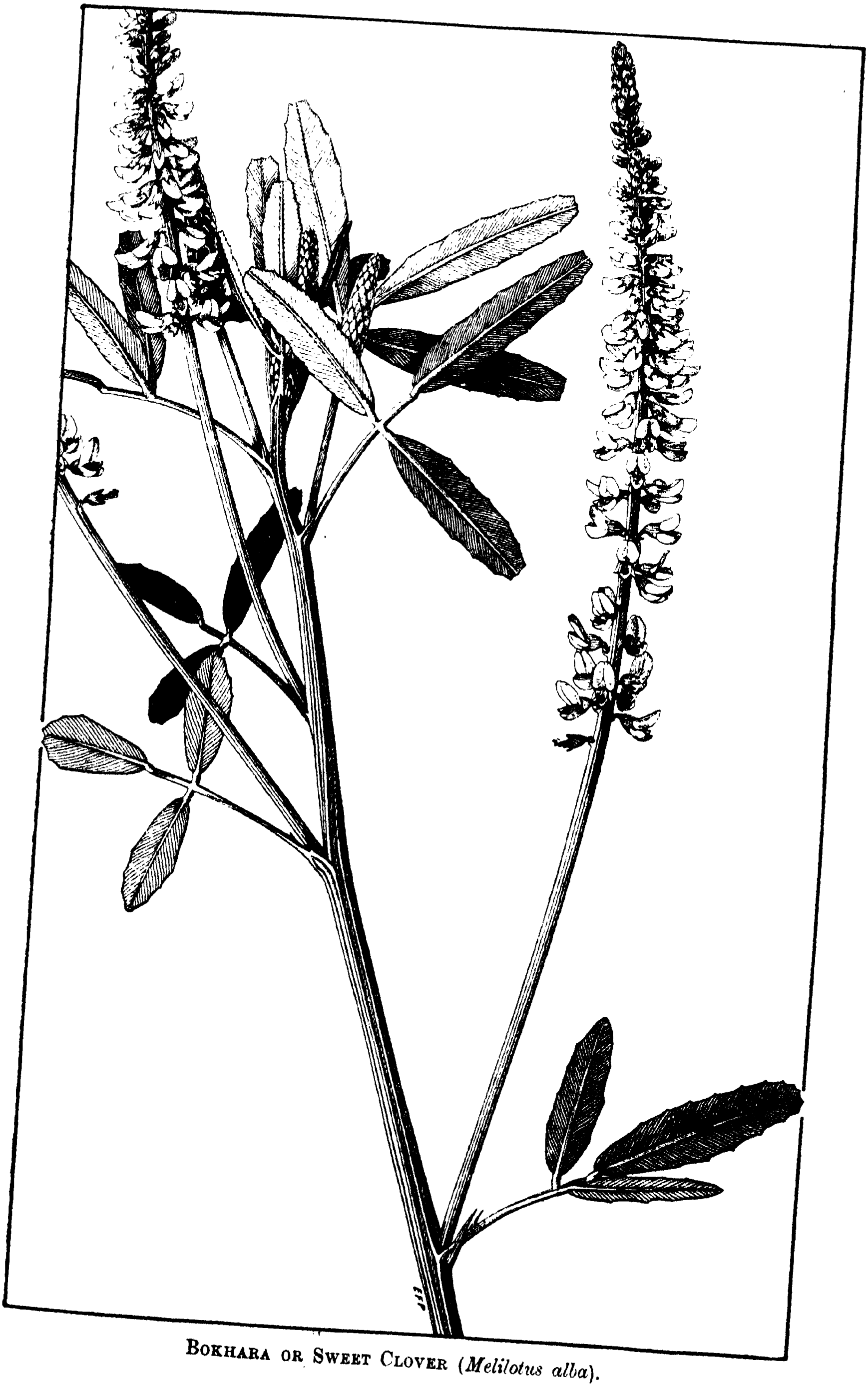
"To ascertain the root growth, a hole was sunk adjoining plants of each strain. It was discovered that both are deep rooters, some of the long fleshy roots having penetrated well into, and in many cases through, the clay band. The American variety should be suitable as a soil preparer for lucerne and other deep-rooting crops."

Since the above was written, the American variety has further developed, attaining a height of fully 6 feet, with much the same characteristics of growth as at Glen Innes. It was noticed, however, that the nitrogen nodules on the plant roots were much more abundant at Yanco than at Glen Innes.

General Remarks.

The plot at Glen Innes provided a splendid harvest for the bees, which swarmed upon the flowers for weeks. Mr. Warry, Apicultural Expert of the Department, has pronounced the honey produced at this stage to be perhaps superior to any hitherto collected.

The greatest drawback to the plant at Glen Innes appears to be the aversion which stock have for it. That this aversion is not general is evidenced by the statement of Mr. R. W. McDiarmid, Assistant Inspector of



BOKHARA OR SWEET CLOVER (*Melilotus alba*).

Agriculture, that there is at Inverell a dairyman who grows a large area of this clover with great success. We should be glad to hear from any other grower who has had experience with this clover from a dairying point of view. The bitter taste of the plant is due to a chemical principle known as coumarin. As will be seen by references to American literature below, the question of how and when stock take to the plant is still a matter of controversy.

Even if the feeding value of Bokhara clover is neglected, however, it appears to be distinctly useful—(1) as a honey producer, (2) as a weed eradicator, (3) as a green mauure, and (4) as a preparatory crop to lucerne. In the last connection, not only do the deep roots penetrate and open up the subsoil, but they are also credited with providing the ground with the bacteria essential to the growth of lucerne. Preparatory to a sowing of lucerne, an area of the clover is at present growing at Yanco Experiment Farm.

The following American references are sufficient to show that Sweet Clover is not everywhere regarded as an undesirable fodder plant :—

"The second year of my experiment I wanted to know the value of Sweet Clover as a milk-producer. I took ten average milch cows from a good Prairie and Blue grass pasture about 10th May and put them into this Sweet Clover patch. It had attained a very rank growth and was more than 2 feet high. The cows were kept there two weeks, and at the end of that time had gained an average of 5 gallons of milk a head. About 1st June I returned the cows to the Prairie pasture, and in two weeks they had lost the 5 gallons that had been gained. Brought back to the Sweet Clover, in two weeks they gained 3 gallons. The weather was very hot, and the clover was really too rank for the best results, but these cows maintained an excellent flow of milk throughout the season on this little half-acre of Sweet Clover. Horses are especially fond of Sweet Clover as pasture and hay, and hogs and cattle thrive on it. Chickens, big and little, like young Sweet Clover better than alfalfa (lucerne)."

"While many individual animals refuse it at first, all kinds of live stock learn to like it, and eat it greedily and thrive on it. Stock take to it more readily than they do to rape or ensilage."

"When I turned my cows in they doubled the milk."

"While stock will not usually take Sweet Clover at first, they will, if starved to it for a few days, acquire a liking for it and do well upon it."

"Many people think Sweet Clover is useless, but they are mistaken. Not only will stock pasture upon it, but they will eat the hay from it readily if it is cut early and well cured."

"I can show hundreds of acres sown to Sweet Clover for pasture, and more being sown every year. There is nothing as good as Sweet Clover for enriching poor land."

It might be noted that at King Island melilot (*Melilotus parviflora*) is pastured heavily.

The value of Sweet Clover as a pasture plant in this State is only known in one or two individual cases, and more information on this subject is invited.

Experimental Feeding with two Poison Plants.

J. B. CLELAND, M.D., and A. H. E. McDONALD, Manager, Coonamble Experiment Farm.*

The Effect of Feeding Wild Indigo, *Swainsona luteola*, to Sheep.

FOR many years the injurious effects which occur in sheep after they have fed for some time upon certain species of *Swainsona*, usually termed Darling Pea, have been well known. The species of *Swainsona* specially incriminated are *S. galegifolia* and *S. greyana*. There seems to be evidence also that *S. lassertifolia* on Flinder's Island, Bass Strait, and *S. procumbens*, Broughton Pea, in South Australia are also poisonous.

Important papers have appeared in this *Agricultural Gazette* from time to time dealing with the question, either describing the effects of these plants on sheep, detailing chemical investigations and search for a specific poison, or presenting the results of experimental feeding. Hitherto no actual poisonous substance has been detected by analysis. Most important experimental results were contributed by Dr. C. J. Martin in 1897 to this *Gazette*. This report may be summarised as follows:—

Dr. Martin fed experimentally, from August to December, six sheep with Darling Pea (*Swainsona galegifolia*), keeping a control set of animals on lucerne. As a result of his experiments, he found that in from a little over four weeks to five or six weeks the animals became affected when fed exclusively on the pea with a little salt and fresh water. When the experiment first began, it was hard for a week or so to get the animals to eat the pea, but after that they ate it well. He sums up his conclusions as follows:—

1. That one can by feeding sheep on Darling Pea reproduce all the symptoms which are attributed by pastoralists to this cause. Briefly stated these symptoms are:—Stupidity, loss of alertness, and an agonised expression, followed by stiffness and slight staggering, and frequently trembling of the head or limbs. Later, clumsiness and unsteadiness ensue, which slowly advance until the animal often falls down. In this stage, the action of the animal in running over small obstacles is characteristic. It jumps over a twig as if it were a foot in height. When first it commences to tumble about, it is able more or less readily to regain its feet; but in the advanced stage of the disease this is impossible, and after exhausting itself in efforts to do so, it remains lying down until it dies. During the whole time, the sheep becomes progressively more bloodless, and in advanced cases the blood when shed appears to the naked eye lighter in colour. It contains fewer red blood-cells (about two-thirds to one-half the usual number). All these symptoms are much exaggerated by driving. Thus, an animal in which the symptoms are little marked, may exhibit them in a striking degree after being driven. In addition to the above, the teeth (especially in young sheep) frequently become loose, and consequently displaced or even dislodged.
2. That the time which elapses before the onset of definite symptoms is three to four weeks in sheep 2 to 3 years old. (It is probable, however, that with younger animals the time is shorter.)
3. That under the conditions of the experiment the animals survived about three months. They lived, however, an invalid's life. Everything was brought to them, and it is improbable that, if feeding exclusively upon pea, and left to shift for themselves in the paddocks, they would survive more than two months.

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* Since transferred to Trangie Experiment Farm.

4. That if a sheep be returned to proper fodder after one month to six weeks' feeding upon pea, and before the symptoms are fully established, it may recover completely.
5. That when once the paralytic symptoms are established, it will not recover ; but if returned to proper food, will remain in much the same condition, becoming neither better nor worse.
6. That the Darling Pea contains a very fair amount of nourishing material, so that animals may, provided they eat it readily, retain their condition on it for some weeks, until the poisonous principle contained has had time to exert its effects.

The disease produced in sheep takes therefore some considerable time to develop. It is obvious if a true poison is present, and this be eaten, that it cannot be exceedingly virulent, but rather a slowly cumulative one. This cumulative action is accentuated by the fact that animals which have once taken to eating the pea can rarely be induced, once they have become confirmed pea-eaters, to eat anything else. As an alternative to the view that the disease is due to a direct cumulative poison of relatively low toxicity, recent work on such human diseases as beri beri and scurvy have suggested the possibility that it may be an instance of one of the so-called "deficiency diseases." In these diseases the ill effects follow because of the absence from the diet of minute quantities of certain substances known as "vitamins," which though present often in exceedingly small amounts, are still essential for the maintenance of the health or growth of the animal. If the former view be correct, it is clear that to prevent the disease developing or to cure it in the early stages, the further ingestion of the slow-acting poison must be checked. If the latter view be correct, it would not matter how much of the pea were eaten provided the deficiency in the vitamins could be compensated for in some other way. Various substances are rich in certain vitamins ; examples of these are yeasts and rice polishings.

In the experiments about to be detailed it was found that feeding sheep on *Swainsona luteola* eventually produced the symptoms of the Darling Pea disease. One of two sheep thus fed died, and the other was profoundly affected. Two other sheep similarly fed, with the addition of a supply of yeast, both became affected but neither died. It would seem therefore that yeast did not in this instance supply the necessary vitamins, if such were lacking. The result of this experiment does not lend support, therefore, to the view that the Darling Pea and Indigo diseases are deficiency ones. The matter is, however, still *sub judice*, for it may be that the yeast in question did not contain the right vitamins which might have been supplied by some other foodstuff.

It will be seen that much work remains to be done in endeavouring to ascertain the actual principles underlying the development of the disease. If these principles can be discovered, it is possible that remedies may be devised by which diseased animals may be cured.

Apparently the same or a very similar disease occurs in America, where it is known as "Loco disease," and here again the illness follows prolonged feeding on certain plants of the pea family, especially *Astragalus mollissimus* and *Oxytropis Lamberti*. Americans seem to have found the same difficulty as we have experienced in attempting to ascertain to what the disease is directly attributable and in finding remedies. Meanwhile, it is necessary to conduct plant-feeding experiments to test what species of *Swainsona* are injurious in this way; under what conditions they are so; in what time the disease may be manifested as a result of feeding with them; and what suggested remedies fail or seem partly or fully successful.

The report that *Swainsona luteola*, locally called "Indigo," was present in the neighbourhood of the Coonamble Experiment Farm, and that it was an alleged poison plant, led the Experiments Supervision Committee to institute the following experiments, planned to ascertain, firstly, the ill effects which follow feeding with this plant; and, secondly, whether yeast might modify the disease if produced or prevent its actual development. The accompanying details show that the four sheep fed on the plant all became affected and one died. As already mentioned, two which received yeast in addition to the indigo both became ill, though neither died.

It was intended to conduct an experiment in the feeding of *Swainsona greyana*, Darling Pea, and two sheep were penned for the purpose. But after the first week sufficient plants for conducting the test became unobtainable, and the experiment had to be abandoned.

In this connection it is of interest to note that the holding of continuous tests of this character is far more difficult than would appear at first sight. In an attempt in 1914, intense heat for a few days caused all the leaves to fall off the plants, making them become "bundles of sticks," and in consequence the sheep would not eat them.

In 1915 it was not possible to conduct any experiments, as sufficient plants for the feeding tests were not obtainable. While in the previous year acres of land were densely covered with "Indigo," in the 1915 season it was difficult to find a plant. The reason probably was that in 1914 there was plenty of rain in February and March, whereas no rain fell in the following season till May, when it was apparently too cold for the germination of the seed.

On 1st September, 1916, at the Coonamble Experiment Farm, two sheep were placed in one pen and two in another, and feeding with *Swainsona luteola* commenced. The species had been identified by Mr. J. H. Maiden, Government Botanist. During the first day or two there was a little herbage in the yards, but this was soon eaten. The sheep very soon commenced to eat the plants, and on the third day were eating 18 lb. per pen of two sheep. This feeding was continued daily, the 18 lb. per pen being just what the sheep could clean up. There was practically nothing remaining until the next supply was given. The animals ate the plant greedily immediately the fresh supply was placed in their yard. Up to 6th October no symptoms had developed. The sheep were fat at the commencement of the experiment, and had retained their condition though receiving no other food beyond the indigo. The indigo when first given was at the flowering stage, but by 6th October seed pods were plentiful and were nearing maturity. It had been noticed in past years that it was about the time when the seeds were ripe that sheep showed signs of poisoning. Up till 11th October the sheep remained in a normal condition. On this date, however, one of them fed on indigo alone, instead of eating as usual, continued lying down, rising up at intervals, and then lying down again. Instead of being lively and alert as hitherto, it had a staring, dull look in the eyes, and kept its neck fixed and high. After a day or so it did not seem inclined to lie down so much and was eating as usual.

On 12th October the second sheep fed on indigo alone became affected in the same way, followed on the 14th by the two sheep fed with indigo and yeast. In all these cases the same symptoms were manifested, that is, apparently abdominal pain, passing off in a day or two, when they were again eating and showing no signs of uneasiness. Instead of regaining their usual lively, alert appearance, they now however held their heads high and had a dull fixed look, and were apparently "stiff in the joints." They began to grow thin, and the wool became hard and dry-looking. They seemed to grow weaker and, during November, showed signs of being unsteady on their legs, stumbling a good deal, apparently from lack of control rather than from weakness. On 27th November the supply of indigo ceased. During the whole of the period since the beginning of the experiment they ate the plant readily and received 9 lb. each per day, which was completely cleared up daily. The two sheep in the yeast experiment received in addition half a pint of baker's yeast per day. On 27th November they were turned out into a paddock, and it was noticed that when they had walked a short distance they began to move erratically, staggering round in a circle and then going on again.

On various occasions after the sheep had commenced to eat the indigo readily, a little good chaff was put into the yard to see if they would eat it, but they refused to take it although before taking to the indigo they had eaten it readily.

The history of these four sheep after they had been turned out on 27th November was that one of the two which had fed on indigo alone failed to recover and died. Its fellow and the two sheep which had fed upon indigo and yeast were still alive on 20th March, 1917, and had improved considerably in condition. They still, however, had a peculiar appearance known as "crazed."

Experimental Feeding of Sheep with Native Wild Tobacco.

The native tobacco, *Nicotiana suaveolens*, has from time to time been suspected as a poisonous plant. Undoubtedly it contains active principles which, when ingested in sufficient quantities, would bring about serious and, perhaps, fatal results. Whether a quantity capable of producing ill effects is likely to be eaten by a sheep naturally seemed worthy of experimental investigation. Accordingly, as this plant was prevalent in the neighbourhood of the Coonamble Experiment Farm, an experiment was outlined and carried out to test this aspect.

Accordingly this trial was started on 25th September. Great difficulty was experienced in getting the sheep to eat the plant, as it has a repulsive smell and taste. By chaffing it, however, and mixing it with wheaten chaff, they could be induced to eat it. Even under these circumstances, however, they managed to a great extent to pick out the chaff and leave some of the tobacco. They ate from 1 to 2 lb. of tobacco each per day thus supplied, the amount generally being about 1½ lb. The two sheep were thus fed until 27th November, 1916, without any harmful effects whatsoever manifesting themselves, the two animals remaining in good condition. It would therefore appear that the eating of 1½ lb. approximately of the green leaves of the native tobacco over a period of two months failed to affect in any way the health or condition of two sheep.

[NOTE.—Readers interested in poison plants can obtain copies of "Plants Poisonous to Stock," an extract from the Third Report of the Bureau of Microbiology, 1912, on application to the Under-Secretary and Director, Department of Agriculture, Sydney.]

IMPORTED CLYDESDALE STALLIONS.

(Owned by the Department of Agriculture.)

TO STAND THE SEASON AT NORTH BANGAROO STUD FARM, CANOWINDRA.

Clandale (imp.) (14628, C.S.B.), by Allandale (12418, C.S.B.).

Royal Warden (imp.) (16045, C.S.B.), by Everlasting (11331, C.S.B.).

Clandale was awarded First Prize at Aberdeen Show, Scotland.

Royal Warden was awarded First and Champion Prizes at the Royal Agricultural Show of England.

Fee.—Five Guineas per mare, or any number over two from same owner at Four Guineas each.

For further particulars, apply

THE MANAGER,
North Bangaroo Stud Farm,
Canowindra.

REQUEST FOR MARCH FLIES.

IN connection with the ivestigations being carried out by Drs. Cleland and S. J. Johnston into the means of transmission of the worm causing worm nodules in cattle from one cow to another, these investigators are desirous of obtaining as many kinds of March flies as possible from any part of Australia, and especially this State. They will be grateful to any readers of the *Gazette* if they will forward them undamaged specimens of March flies, sometimes called "Horse-flies." These may often be easily caught around horses and cattle. The dead flies travel safely wrapped up in a piece of tissue paper and enclosed in a small wooden box. The locality and date should be added. They would also like information as to the prevalence or otherwise of March flies in different districts, and when they first appear and when they are last seen. Specimens and information could be forwarded to Dr. J. B. Cleland, Department of Public Health, Macquarie-street, Sydney.

The Cultivation of "Spineless" Prickly Pear.

REPORT ON EXPERIMENTS AT NYNGAN.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

TOWARDS the close of the year 1908 I planted a number of Spineless Opuntias (Prickly Pears, because most of these plants have spines) at the Experiment Farm at Coolabah.

In 1910 the operations of the farm were transferred to Nyngan and the plants destroyed. The work was therefore recommenced at the new Nyngan Farm.

Below is a list of the joints of twenty kinds of spineless, or nearly spineless, prickly pears, planted out at Nyngan in October, 1912. The notes *re* spines are by Mr. H. J. Kelly, the Manager of the Farm, and are dated 5th May, 1913.

Mr. Kelly made further reports on them on the 4th December, 1913, 30th September, 1914, and 24th November, 1915.

My objects in making these experiments at Nyngan (a dry country area, 382 miles west of Sydney, with a 17-inch rainfall) were stated in my minute of the 27th November, 1915:—

(1) To ascertain the amount of reversion which will take place in the Nyngan climate, as evidenced by the increased spininess on fruits and joints. We quite expect increased development of spines where they exist, and spinules, and if at any time Mr. Kelly can give particulars of the amount of increase they would be useful.

(2) For fruit.—Fruits are used in many countries of the old and new world for eating direct, or for the making of a jelly after straining. If there are any spinules on fruits, the method adopted in Sicily is to drop the fruits as gathered into hot water, by means of a wire spoon, when the spinules drop to the bottom.

In view of the difficulty of getting fresh fruits at Nyngan, it would be very pleasing to me if these fruits proved to have any local merit.

(3) And, perhaps most important of all, Mr. Kelly might keep in view the question whether the joints are of any fodder value. In districts in which the Pest Pear is abundant, the joints are prepared for stock in two ways—it may be passed through the chaffcutter and fed to stock in slices, or steamed so as to soften it, and mixed with a little pollard.

As time went on, it began to be evident that the growth of these Opuntias at Nyngan was unsatisfactory, and on the 18th May, 1917, Mr. Kelly furnished the interesting report which follows. As I consider the lessons which the experiment had to teach have been ascertained, I have recommended that the plants be destroyed.

On the 16th October, 1912, twenty varieties of Spineless Opuntias were planted at Nyngan Demonstration Farm for the purpose of ascertaining :—

(1) Their suitability to local conditions.
(2) Their liability to revert spines.
(3) Their economic value.

The plants were obtained from the Botanic Gardens, Sydney, and were planted in well-prepared ground.

From time of planting until July, 1913, the weather conditions were favourable to plant growth, owing to good rainfall during that period.

All the plants struck and made fair headway.

From July, 1913, onward to April, 1916, very dry conditions were prevalent, only occasional showers fell, yet it is worthy of note that every plant survived, and practically all continued to make fair growth.

At times, however, when the conditions were exceedingly dry, they would display a withered appearance, but immediately rain fell (or even if the atmospheric conditions became moist) they would revive and again look fresh and healthy.

In March, 1916, just prior to the break-up of one of the most severe periods of drought on record, some sheep were turned into the paddock where the Opuntias were growing.

After eating all other available vegetation, including the foliage of several salt bushes of the Old Man variety, they commenced to nibble at the Opuntias. In a few instances the plants were eaten down; the majority were eaten but slightly.

From April, 1916, to February, 1917, the rainfall was abundant. The whole of the plants made growth, and some attained a height of 6 feet, with a breadth of almost the same measurement. In February, 1917, the conditions again becoming dry and continuing so, sheep were again placed in the paddock in April, and, after eating all other green vegetation, took to the Opuntias again, practically eating the lot down.

The lower and harshest parts of the plants were all left uneaten.

Although these plants would probably thrive better in warm, moist climates, their "suitability to local conditions" has been amply proved by their having lived and made satisfactory growth through a most severe drought—that of 1914–15–16.

The trial has proved, undoubtedly, their qualities of drought resistance.

Liability to revert to spines.—At the commencement of growth, most plants developed small spinules on the joints, but not in a very marked degree, and not sufficient to be harmful to stock.

No ill effects have been noticed on the sheep which recently ate down the plants.

Later growths are not, perceptibly, more spiny than were the earlier.

The fruit, however, has always been very spiny. (The minute spinules are referred to.)

Economic Value.—As a fodder plant, its cultivation cannot be recommended for this district. Even the fruit, as an article of diet, has little or no value; and neither plant nor fruit is ever likely to be worthy of cultivation from this point of view.

The only quality in its favour that may be spoken of is its power to withstand prolonged periods of drought, but when compared with such plants as Old Man saltbush, its virtues are reduced to a negligible quantity.

When grass and herbage are too scarce or too dry to alone sustain stock, any plant that will withstand prolonged droughts and provide nourishment is worthy of recognition as a reserve fodder, but Opuntias fail to give the same satisfaction as the saltbush, which is a quicker grower, and supplies a better balanced and much more highly nutritious food.

Other uses may ultimately be found which would justify further trials, but at present there are no indications of the Opuntias having any special virtues that cannot be derived from other sources, and from which no danger exists of their ever becoming a pest.

SUMMARY of Experiments with "Spineless" Prickly Pear, Nyngan.

Reference No.	Description and Record of Pear.	Report of 5th May, 1913.	Report of 4th December, 1913.	Report of 30th September, 1914.	Report of 24th November, 1915.
1	***Opuntia decumana*** **(of Sydney Botanic Gardens).**	3 feet high, very slightly spiny, upright growth.	Rather withered looking, going out of flower, 5 young leaves, small spines.	Very much withered, no recent growth.	Fair growth, fruiting, fruit rather spiny.
81	*O. ficus-indica* (orange-green fruit).	15 inches high, spreading, spiny...	Rather dwarfed in growth, but healthy looking, 12 joints, spiny.	Fairly fresh looking, making young growth, spiny.	Good growth, heavily fruited, rather spiny.
87	*O. ficus-indica* (claret-fruited)	18 inches high, much branched, slightly spiny.	Much branched, 16 joints, fruiting, spiny.	Fresh looking, commencing to fruit, slightly spiny.	Very good growth, heavily fruited, slightly spiny.
94	*O. ficus-indica* (yellow-green fruit).	18 inches high, much branched, slightly spiny.	Much branched, 12 joints, fruiting, spiny.	Slightly withered, commencing to fruit, slightly spiny.	Fair growth, heavily fruited, fruit very spiny.
96	*O. lanceolata* var. *macrocarpa*	21 inches high, much branched, slightly spiny.	Very much branched, 17 leaves, fruiting, very slightly spiny.	Fresh looking, young shoots, almost spineless.	Fair growth, fruiting, very slightly spiny.
98	*Nopalea coccinillifera* ...	Rather poor growth, almost spineless.	Rather poor growth, 6 to 12 leaves, flowering, spineless.	Very poor growth, some plants fruiting slightly, slightly spiny.	Poor growth, very little fruit, slightly spiny.
265	*O. ficus-indica* (Algiers) ...	2 feet high, much branched, broad leaved, slightly spiny.	Fair growth, much branched, broad jointed, to 28 joints, fruiting, slightly spiny.	Very fresh looking, fair growth, young shoots, slightly spiny.	Splendid growth, medium fruited, rather spiny.
278	*Nopalea Karwinskyana* ...	15 inches high, very much branched, almost spineless.	Very much branched, 20 joints, fruiting, almost spineless.	Fresh looking, fruiting, fair growth, very slightly spiny.	Fair growth, very heavily fruited, rather withered in appearance, owing to heavy fruitage, slightly spiny.
601	*O. lanceolata* (Burbank) ...	2 feet high, broad leaf, slightly spiny.	2 feet high, 21 joints, slightly spiny.	Fine healthy plant, fair growth, almost spineless.	Very sturdy plant, medium fruited, slightly spiny.
602	*O. ficus-indica* (U.S. Dept. of Agric., 14953).	18 inches high, spiny, upright ...	18 inches high, 8 joints, upright growth, spiny.	Rather poor plant, some young growth, slightly spiny.	Fair growth, no fruit, almost spineless.
610	*O. ficus-indica* (Palmer) ...	9 inches high, spiny	6 joints, slightly spiny, rather dwarfed growth.	Rather poor plants, no young sprouts, slightly spiny.	Fair growth, no fruit, slightly spiny.
618	*O. ficus-indica* (Temperanillo)	12 inches high, spineless, upright growth.	Upright growth, 7 joints, no spines.	Rather poor plants, slight young growth, spineless, not standing drought as well as most of the other varieties.	Fair growth, no fruit, spineless.
620	*O. ficus-indica* ("Bianchi") ...	2 feet high, very much spreading, slightly spiny.	Very much spreading, 18 to 20 joints, slightly spiny, fruiting.	Healthy plants, some young growth, slightly spiny.	Fair growth, heavily fruited, slightly spiny.
630	*O. ficus-indica* ("Rossi") ...	2 feet high, spreading, slightly spiny.	Spreading habit of growth, 17 joints, fruiting, slightly spiny.	Fresh looking healthy plants, fruiting, very slightly spiny.	Sturdy growth, heavily fruited, slightly spiny.
647	*O. decumana* (W.H., Chatswood).	15 inches high, much spreading, slightly spiny.	Spreading habit of growth, 13 joints, fruiting, slightly spiny.	Withered appearance, some young growth, slightly spiny.	Medium growth, fruiting, slightly spiny.
662	*O. fusicaulis*	2 feet high, slightly spiny ...	8 to 16 joints, slightly spiny ...	Fair plants, no recent growth, almost spineless.	Fair growth, no fruit, almost spineless.
681	*O. gymnocarpa*	2 feet high, much branched, slightly spiny.	Much branched, 8 to 14 joints, fruiting, slightly spiny.	Fairly healthy plants, commencing to fruit, slightly spiny.	Fair growth, heavily fruited, slightly spiny, fruit very spiny.
687	*O. gymnocarpa* ("Jacotilla")...	2 feet high, fairly upright growth, slightly spiny.	Fairly upright growth, 12 to 15 joints, slightly spiny.	Healthy plants, some young sprouts, very slightly spiny.	Good growth, no fruit, slightly spiny.
707	*O. gymnocarpa* ("Santa Rosa").	12 inches high, spreading habit of growth, very slightly spiny.	Spreading, 9 joints, very slightly spiny.	Small plants, but healthy, no young growth, almost spineless	Small plant, healthy, very little fruit, almost spineless.
709	*O. gymnocarpa* (California) ...	15 inches high, almost spineless...	9 joints, almost spineless, coming into flower.	Fairly healthy plants, no young growth, spineless.	Fair growth, no fruit, slightly spiny.

Cotton in Australia.

SOME HISTORICAL NOTES.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

COTTON is such an important product, both in peace and war, that the Executive Committee of the Advisory Council of Science and Industry has been directing attention to its possibilities in Australia. The Committee's Report contains the statement that, at the time of the American Civil War, owing to the inducement offered by the high price of cotton, Queensland exported twenty-six million pounds of ginned cotton, worth £1,300,000. One of the attractions offered in connection with the meeting in Queensland in 1909 of the Australasian Association for the Advancement of Science was a visit to Ipswich, where we saw a cotton mill; it contained much machinery, but work had almost entirely ceased. The Committee already mentioned is making further inquiries in regard to the industry from various standpoints.

The Committee's report is largely reproduced in this *Gazette* for February last (p. 107), with a useful supplement on cotton-growing in New South Wales, based on results obtained at Yanco from seed distributed in 1914.

The cultivation of Cotton in Australia is a very old industry—one of the very oldest—for we find (*Governor Phillip's Voyage*, p. 33) that cotton seeds (perhaps a few plants) were brought from Rio de Janeiro by the first fleet, in other words, in January, 1788.

Doubtless it grew at Sydney in the Governor's garden, or in the infant Botanic Garden, but I do not know how it fared there in the very earliest days. Lieutenant-Governor King, then in England, writing to Sir Joseph Banks, on 22nd August, 1799 (*Hist. Rec. N.S.W.*, iii, 705), says :—

> You will recollect, Sir, that in my different letters to you from the other hemisphere, I have observed the probability of cotton becoming a probable object of attention. Not being possessed of any information respecting the culture of that shrub, the trials that I made of it on Norfolk Island were by no means satisfactory. Although the seeds that were sowed did extremely well, and much cotton was produced, still the ignorance we laboured under respecting its culture prevented any other exertions than barely ascertaining that it would grow extremely well.

He then goes on to say that a Mr. Wall, of the Bahamas, had given him cultural information in regard to the plant which would be of value to him. King arranged for improved seed to be sent from the Bahamas to Sir Joseph Banks, and he also arranged to take out with him six cards and a portable gin for extracting the seeds from the cotton. Perusal of King's letter will show that he looked upon the cultivation of cotton as of no little importance to the infant colony.

Subsequently (*Hist. Rec. N.S.W.*, iv, 668) he reported, on 31st December, 1801 :—

> Respecting cotton, much seed has been sown here, both from the Bahamas and the Isle of Bourbon. Experience has shown that it will not do here, but there can be no doubt of its succeeding further to the northward, if a harbour and access to it can be found within and through the Labyrinth (Barrier Reef), from the latitude of 20° to Cape York.

There is a fuller note on this aspect of the subject in *Hist. Rec. Austral.*, iii, 435.

Surgeon Luttrell, under date 8th October, 1807, wrote (*Hist. Rec. N.S.W.*, vi., 293) :—

> As the climate of this country is favourable to the growth of the annual cotton plant, such as is the produce of the Carolinas, the cultivation of it as an exportable article for the China market would prove of great benefit to the Colony. But, unfortunately for the Colony, there is not a true cotton plant in it, or ever was since the Colony was founded —the *Gossypium* of Linné.

What he means is not quite clear, as he does not indicate what species he is referring to.

Taking, then, a leap of a few years, we find the statement in the *Sydney Gazette* of the 23rd September, 1826, that it was recommended at a special meeting of the Agricultural and Horticultural Society, held on Wednesday, 30th August, 1826, that a premium of the lesser Gold Medal be awarded to Mr. Charles Fraser, the Colonial Botanist (and Superintendent of the Botanic Garden), for the culture of colonial cotton from the Sea Island, seed during the year 1825, and that Mr. Fraser be requested to deposit a sample of the same, both in its raw and its manufactured states, together with the report of the Glasgow manufacturer thereon, in the hands of the Secretary of the Society.

The same paper, under date 8th October, 1827, says that, the last specimens of cotton which were sent from the Government Garden to Glasgow were allowed to exceed in fineness those which had been formerly transmitted.

Vine Cotton Seed.

The next reference is contained in a letter signed by " A Friend to Australia " in the *Sydney Gazette* for 16th June, 1828, entitled " Valuable introduction in New South Wales calculated for the barren and hitherto unproductive land, particularly on and near the sea-coast, harbours, creeks, and sandy soil."

The writer, who had many years' experience in the West Indies, wrote to West Indian friends for the most approved cotton seed in use, also on arriving at South America he ordered a supply of Pernambuco seed.

One West Indian friend wrote to him, as follows :—" I send you a sufficient supply of Vine cotton seed to plant a large tract of land, with directions for planting. It is far superior to any other cotton seed grown; it requires planting but once in ten or twelve years instead of annually, as in the case of ordinary cotton seed. Indeed, I think it will prove invaluable in a Colony like New South Wales, where you have not the labour we have here. This plant becomes more productive every year. I planted an acre at Marine Villa,* and it yielded 190 lb. nett cotton; it brings 15d. per lb. in the Home market, whilst the ordinary West Indian cotton only commands 7d. per lb."

Beginning at page 161, Dr. J. D. Lang, "Cooksland" (1847), has some interesting notes on cotton as a crop for a new political division, which he proposed should extend fron the mouth of the Clarence to Rockhampton.

Dr. Lang (*op. cit.*, p. 169), republishes an extract from Mr. Walter Levi's letter from the *Australian* of 1828 concerning Vine cotton seed, and gives cultural directions. Mr. Levi was it appears, the "Friend to Australia" already quoted, and the same letter was published in the *Sydney Gazette* and *Australian*.

I do not know what this Vine cotton of the West Indies is. Mr. A. A. Hamilton points out to me in Watts' *Dict. Econ. Prod. of India*, Vol. iv, pp. 4 and 28, that *Gossypium Wightianum*, an Indian species, is, in its wild state, found as a creeper over other trees. But although this is a cotton which is a vine (all cottons have leaves more or less distinctly resembling those of a vine in shape), it is not found in the West Indies, and hence is not the one of which we are in search.

In the 1831 *Australian Almanac*, under "Notes," it is stated that "the Australian climate is well adapted to the growth of cotton, and we may refer to documents relating to its cultivation published in the *Sydney Gazette* of the 27th November last upon the receipt by Messrs. Alston, Finlay & Co., of Liverpool, of three bags of New South Wales cotton, the first ever exported from this colony, by J. Maclaren, Esq., of Sydney."

Trials with Cotton in New South Wales.

In the 1848 report of the Director of the Botanic Gardens, it is stated that in the north-west of the Upper Garden there is established a collection of economic plants, especially including cotton.

On the 18th August of that year Mr. William Gardner wrote from Maitland acknowledging the receipt of cotton seed from the Botanic Gardens, and stating that he had lived in Georgia, one of the cotton States of the United States, for some years. He intended to pursue its cultivation in the northern districts.

On the 20th August, 1862, the Director, Mr. Moore, issued a circular stating the terms on which the various kinds of cotton seed would be issued to applicants. This was in connection with a present of 1 cwt. of Sea Island cotton seed from the Cotton Supply Association of Manchester, Lancashire being at that time cut off from supplies of cotton from the Southern States of America, owing to the Civil War.

The experiment was gone into very seriously so far as the Sydney Botanic Gardens were concerned, much correspondence resulting, and many specimens of the product being despatched to England for report. But the New South

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* The soil of the Marine Villa is inferior to that of Vaucluse or Elizabeth Bay.

Wales results with the plant fell far short of those obtained in Queensland, already briefly referred to. Indeed, it seems to me that the northern State seems to present better natural conditions for the crop than our own.

Many will remember the campaign that the late Mr. John Musson, of Sydney, undertook, in regard to the cultivation of cotton in New South Wales, about twenty years ago. He wrote frequently to the Press and interviewed many people. He compiled a useful pamphlet, which was published by the Department of Agriculture in 1897, entitled "Cotton and how to grow the plant." To my knowledge he did not spare pains to get at the facts, but his labours did not have any practical result that I heard of, at least in New South Wales.

From time to time people in New South Wales communicate to me the fact that they have produced cotton from a few plants. Nobody disputes the fact that cotton can be grown in many parts of New South Wales, but to grow the best varieties at prices to compete successfully in the world's markets is another matter.

Caravonica Cotton.

An enterprising Queensland settler (Dr. Thomatis, of Cairns) placed on the market the so-called Caravonica cotton, and its production has been attended with a good deal of commercial success. There are many notes on it in various issues of the *Queensland Agricultural Journal*, but those in the issues of October, 1906, p. 194 (illustrated), and October, 1912, p. 343, are probably the most important, and are well worthy of perusal by all interested in the subject.

But cotton is such a technical subject that the opinion of a layman is of little or no value, and I do not presume to decide on the value of Caravonica. Valuable it undoubtedly is, for certain purposes, but the following should be perused, and, as regards England, it will be borne in mind that cotton manufacture is a national industry, and the judgments of her experts in cotton command respect everywhere. See the *Agricultural News*, vi, 54 and 57. This is the official journal of the Imperial Department of Agriculture of the West Indies. A report from British Guiana (p. 54) says :—

> Caravonica cotton, three varieties. These are stated to have made satisfactory growth and bearing, but the lint varied in each individual seedling; this was to be expected since this cotton is a late cross between Black Peruvian and Sea Island.

A report from the Secretary of the British Cotton-growing Association to the Imperial Commissioner of Agriculture (p. 55) says :—

> Your letter with enclosure relating to Caravonica cotton to hand. This cotton, which is probably a hybrid of Sea Island and Rough Peruvian, does not at all compare with the West Indian Sea Island. The statement that "of all the cottons collected by the Association the Caravonica was adjudged the most valuable, &c." is not correct. It is very undesirable that any of this seed should be used in the West Indies, as the cotton lacks most of the essential characteristics of Sea Island.

At the same time it has been profitably grown in many localities where it cannot cross with the Sea Island cotton.

STUD SEED *versus* BARN-SELECTED SEED MAIZE.

AN experiment with stud seed maize as against barn-selected seed maize was sown on the River Farm of the Hawkesbury Agricultural College on 14th September, 1916. The variety used was Red Hogan, and six alternate rows 7 chains long and 4½ feet apart were planted with the maize dropper.

The history of the stud seed used in the test is as follows:—In the ear-row test carried out at the College in 1914–5, ears numbered 10, 32, 26, 1, 13, 6, 36, and 30 proved to be the highest yielding in that order. As the residues of these ears had been saved after planting the ear-row test referred to, a breeding plot was sown on the poor upland soil at the College in 1915–16, consisting of five rows, with the residue of ear 10 in the centre and the residue seed from the other ears bulked together and sown in the other four rows. During the growth the centre row was detasselled, and was thus cross-fertilised by the rows on either side. Thus in the centre row seed was produced by crossing upon the best yielding strain the next best yielders. Seed was harvested from this centre row, but owing to the poor crop, not more than a few pounds of good seed could be obtained from this row of 5 chains in length. Poor though this sample of seed was, the best cobs being no more than 7 or 8 inches long, it was felt that this seed would give a good account of itself, owing to its breeding. The results justify this expectation.

The barn-selected seed for the experiment was selected from the barn in the usual manner—good big ears up to 10 inches in length and shelling a prime sample of grain.

The results indicate the progress in the work of improving the yield of maize by the ear-row system, based as it is on the performance of different strains as represented by different ears in the ear-row test.

In the first week of October, 1916, when the plants were a few inches high, the plots were covered by flood waters, which remained for several days and ruined the experiment.

Fortunately, a little seed had been saved, and this was sown alongside the stud ear-row tests on 3rd October, 1916. One row of each was sown, 9 chains long and 4½ feet apart. The germination in both cases was satisfactory.

The following notes were taken during growth:—

December 8th, 1916.—Plants, 18 to 24 inches high; row of stud maize looks better, darker green in colour, and 3 to 4 inches taller; row from barn-selected seed contains more suckers.

February 2nd, 1917.—Plants, 11 to 12 feet high, and cobbing well; row of stud maize shorter, and ears lower than barn-selected seed, which is a significant reversal of the comparative heights when first observed; in colour, the stud row is still the darker green, and the lower leaves are more persistent; a greater number of two-eared stalks present in the stud plot, the barn-selected seed showing single ears almost throughout.

The plots were harvested on 18th May with the following results:—

	Yield per plot. (Unshelled.)	Yield per plot. (Shelled)	Yield per acre.
	lb.	lb	bus.
"Stud" Seed	321	269·64	78·47
"Barn-selected" Seed ..	276·5	232·26	67·59

The results were therefore in favour of the stud seed by 10·88 bushels to the acre.—H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture, and W. D. KERLE, Experimentalist, Hawkesbury Agricultural College.

Poultry Notes.

OCTOBER.

JAMES HADLINGTON, Poultry Expert.

PURSUING the subjects dealt with in these notes during the last four months—in which hatching, rearing, feeding, &c., have come under review—it is proposed to follow the chickens up to adult stage in regard to housing from the time they leave the brooders. This is the stage at which many fail to continue the success attained in the earlier stages.

After the warmth to which they have been accustomed in the brooders, chickens are often put into houses that are bleak and cold. Crowding is then almost certain to eventuate. The attendant, not understanding what the consequences will be, fails to visit the chickens during the cold hours of the night, and has no idea what is happening. Next morning, perhaps half a dozen or even more of the strongest chickens in the lot are found dead. Similar losses during the following nights being no better understood, the attendant comes to the conclusion that some fell disease has made its appearance, and if a beginner, he consults a neighbouring poultry farmer, who very frequently advises a resort to disinfectants, isolation, and all the precautions that suggest themselves in connection with an epidemic disease. In reality the deaths have been caused by asphyxiation consequent upon the strong chickens boring their way under the others.

If the trouble has not manifested itself in exactly this way it will have done so in another, the exact form largely depending upon the circumstances. Chickens are seen to be feathering badly, or the feathers are found to be disappearing from the heads and shoulders. Here again the wiseacres come along and discover that the chickens are not making feathers, and advise that feather-making material should be fed. This appears to be scientific, and books on foods and feeding are consulted, and a new ration is prepared to induce the chickens to grow feathers.

The real cause of the trouble, however, is that the chickens have constantly crowded together at night to obtain warmth, have sweated, and have failed to grow feathers or have lost those that have grown.

When chickens are seen to be getting bare of feathers about the head and shoulders, and the down is disappearing from under the body, the cause may be put down as overcrowding. To get over the difficulty different methods may be resorted to. Either the chickens should be divided into smaller groups, or small camps should be made for them where the heat from their bodies is sufficiently conserved to render crowding unnecessary. At the same time, this should be done in such a manner as to allow of ample ventilation. For this purpose there is, perhaps, no better method than to use a cover board, measuring about 4 feet x 3 feet. This can be placed against the wall of the poultry house at an angle of about 45 degrees, the end being kept clear of the corner by about 6 or 8 inches, so that while forming a cover under which warmth is conserved, there is still ample ventilation passing over the chickens to carry away the bad air exhaled by them.

Getting Chickens to Roost.

First of all, when dealing with this subject we should realise that it is not cold that hurts the chickens, but the consequences attendant upon crowding or packing together. It therefore follows that the sooner chickens learn to roost, other things being equal, the better, for development will be obtained and the risks of sweating and of disease will be minimised. A good way of getting over this difficulty and of teaching the chickens to roost at an early age is to make a platform composed of battens, 3 inches x 1 inch, upon which the chickens are induced to camp. The battens can be supported on cleats nailed to the walls of the poultry-house about 8 inches from the floor. A board is placed in front to act as a ramp, and to prevent the chickens from getting underneath. The coverboard mentioned above can be used on the top of this platform. At a later stage, after perhaps a week or two, according to the size of the chicken, proceed to induce roosting by taking out one batten at a time, and spreading out the remaining ones. This will, of course, leave a small opening between the remaining battens, and as others are taken out later the width between the battens is still further increased. In this way the chickens are left to roost, and once having become accustomed to it, they will continue to follow their instinct, and will thus get over the habit of camping on the floor. Many poultry-keepers attempt to put their chickens on to the roosts at night, but this is tedious, and mostly unsuccessful, because the chickens that have become accustomed to camp on the floor will invariably get down again into that position.

"Leg Weakness."

Many inquiries are received in regard to "leg weakness" in baby chickens and in growing stock generally.

In dealing with this subject a number of factors must be taken into consideration. For instance, a chicken may be so weak when hatched as not to possess the proper use of its legs, or it may be that just as soon as the strain of making feathers begins to be felt, "leg weakness" makes its appearance.

The condition may be described very briefly. The chicken is seen to fall over on its side, to get up again, and to repeat the performance frequently, though apparently perfectly healthy. Faulty incubation or faulty brooding may in many instances be responsible for this, but most frequently the trouble is traceable to degenerate breeding stock, or to want of proper attention to the breeders.

It sometimes happens that chickens of poor constitution—whether the result of one or other of these causes—survive baby chickenhood fairly well, but later on prove unable to stand the extra strain thrown upon them by the various changes connected with development.

When this occurs, many poultry-keepers console themselves with the idea (a very prevalent one) that the birds have grown too fast, and their bodies have become too heavy for their legs, and, as already remarked, an effort is made to remedy matters by the use of chemical foods that supply an extra amount of bone, &c. Unfortunately, this idea finds encouragement in much current poultry literature, but it is incompatible with the writer's experience.

The truth about "leg weakness" is that in nearly every instance it is the result of one or other of the causes referred to above, and the remedy lies rather in the direction of stronger birds in the breeding pens, and of incubating and rearing the stock under better conditions.

The degeneracy that is at the root of "leg weakness" might be found either in too close breeding, or in a general failure to secure the proper development of the chickens one year after another, until the flock has become puny. However it is brought about, there is no escape from the fact that "leg weakness" is an almost infallible sign of degeneracy, and that it has preceded the downfall of nearly all the one-time useful breeds of poultry that have now almost disappeared.

It is almost useless to prescribe for this trouble. Doctoring and dieting will avail little, because it is nearly always accompanied by malnutrition more or less pronounced, and it rarely pays to attempt to make such as contract "leg weakness" into profitable stock. Valuable exhibition specimens are often worth treatment from that point of view, but they should never be used as breeders. Lewis Wright recommends the following prescription for cases of this kind:—Strychnine 1 grain, citrate of iron 1 drachm, phosphate of lime 1 drachm, quinine di-sulphate 15 grains. Make the whole into thirty pills, and give one twice or three times per day.

Aged birds sometimes suffer from leg troubles, mostly of a rheumatic or gouty nature. Needless to say, treatment in such cases is almost useless.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bimbaya.

The annual meeting was held on 2nd August, when the following officers were elected :—Chairman, Mr. T. Heffernan; Vice-Chairmen, Messrs. W. A. Robinson and E. T. Boller; Hon. Secretary and Treasurer, Mr. J. R. Boller.

A paper was read by Mr. A. Robinson, entitled "The manufacture of cheese at Hawkesbury Agricultural College," and one by Mr. J. R. Boller, entitled "A trip through the wheat and irrigation areas."

Braidwood.

A meeting was held on 23rd August, the business being restricted to general matters and the arrangement of a syllabus for the year.

Cattai.

A meeting was held on 22nd August, at which a discussion took place on noxious weeds and their eradication.

A number of specimen packets of seed having been received from the Department, the members discussed the most suitable method for testing the suitability of such crops for the district.

Clovass.

A meeting was held on 29th August, which was attended by fourteen members. Arrangements were made for various future lectures, and one new member was admitted.

Coraki.

A meeting was held on 14th August, when it was decided to again prepare an exhibit of agricultural produce for the Coraki show. Arrangements were made for the scholars of the public school to participate in a competition for the cultivation of certain suitable products.

Several members promised to give assistance in the way of prizes, seeds, and the necessary land.

Another meeting was held on 22nd August, at which Mr. O. C. Balhausen, Dairy Instructor, delivered a lecture on dairy subjects.

METHODS OF CLEANLINESS IN DAIRYING.

The lecturer said that, with the prospects of more or less prolonged storage of butter, due to the strike and difficulties of shipping space, it would now be more necessary than ever to pay strict attention to the treatment of cream, because the better the butter the longer it could be kept in cold store. Quite 75 per cent. of butter faults could be traced to want of cleanliness in milking. In this connection he could not too strongly reprobate the filthy practice of the milker dipping his fingers in the milk in order to soften the cows' teats. A basin of clean water should be found in ever yard for the purpose of cleansing the cows' teats and udders, and the milkers' hands and clothes should be as clean and free from dirt and dust as possible. Dirt on cows' teats was a very prolific cause of bad cream, and when this dirt dropped into the milk it carried with it germs which had a very deleterious effect on cream. The bails should be regularly disinfected and limewashed, and the yards kept free from manure. Germs in the dust in the yard caused stringiness in the milk and cream.

The unwashed separator also caused a lot of second-class cream. The separator should be washed both morning and evening. The practice of washing only in the morning was strongly condemned. He knew many farmers did not wash the separator at night, and their cream in the morning must be full of germ-life. Some authorities had said that quite 90 per cent of inferior butter was due to neglect in this respect, though personally he thought that figure was an exaggeration. All utensils in the dairy should be cleansed with cold water first, and then with soda and hot water, and left to dry in the sun. Rusty cans and lids should be strictly eschewed. Milking machines were a fruitful source of trouble unless carefully attended to. Neglect the rubber once or twice, and no power on earth could prevent inferior cream. The pores in the rubber took in decomposed matter, and the only remedy then was to throw the rubbers away and get new ones. The rubbers, after being cleaned, should be left in formaldehyde—1 part of formalin to 50 of water. This solution needed only to be renewed about once a week. Swamp water and stagnant water from holes were responsible for a lot of inferior cream on flat country. Cows coming off swamps must, therefore, have their teats and udders thoroughly cleansed at each milking. Dairy buildings should be away altogether from the milking yards, otherwise on windy days germ-laden dust entered the cream. Cans should be washed regularly as they came from the factory, and particular attention paid to the lids. Never send the cream from newly-calved cows to the factory. Except when mixed with a large volume of other cream its presence can always be detected by a very pronounced odour. A cream cooler should be used at every dairy, and the cream in the cans should be stirred at intervals with a proper stirrer—no wooden material to be used—in order to allow the gas to escape. Above all, the main point in dairying from the first to last was scrupulous cleanliness. Where the water supply on a farm was pure, and cleanliness was observed at the dairy, the result could not but be a high-class butter of splendid keeping quality.

Cotta Walla.

A meeting was held on 7th August, at which Mr. H. A. Grimson read a paper, from which the following is taken.

Hand-feeding Cows.

Unless we can feed each cow without her interfering with her neighbour, we are going to have trouble, and if we are going to feed them in the open there will be mud, &c., in abundance. We must first have a suitable shed. To build a shed capable of holding fifteen to twenty cows on a first-class plan would mean that a lot of money would have to be spent, especially with materials at the present high prices. All that is necessary is posts, slabs, wallplates, cross-beams and straw (thatching). A shed 54 feet x 12 feet is capable of holding fifteen cows. The feed box runs something more than half way through the shed; every 3 feet there is a small post close to the feed box, and around the post a couple of strands of wire, just tight enough to slip up and down. A bolt should be driven into the post to prevent the wire slipping too low. On the wire is a ring, and through the ring runs a strap just long enough to pass comfortably round the cow's neck.

No branch of dairy farming is more important than the feeding and treatment of dairy cows, and yet none is more generally neglected. The direct influence upon the milk a cow produces of what she eats and drinks cannot be too strongly impressed upon the farmer; and of equal importance are the conditions under which food and drink are taken. If she is illtreated by being chased by dogs or over driven, the milk supply will show the effects in quality and quantity. If not properly housed and fed in the winter, not only will the cow pay the penalty, but the farmer too, for the milk yield will be less. One of the greatest mistakes made in this district is to suppose that the best method of dealing with the cow in the winter is to turn her out for three or four months, considering that it does not matter very much how she gets through so long as she is no trouble, and just keeps herself alive, it being anticipated that when the spring comes she will pick up, and presently give a big flow of milk. Some day we may learn to understand the effect that starvation has upon the cow, but one thing is certain, she must get back what she has lost before she is going to return either the quality or the quantity she would have given had she been fed right through the winter. It is estimated by competent authorities, that a dairy cow which gives less than 300 gallons of milk in a season is kept at a loss; if she is pinched for food she will give much less rather than more than this amount. To feed a cow with a daily ration of 10 lb. chaff and 4 lb. bran entails a very small expense, when we consider the quantity of butter a cow will produce.

French's Forest.

A meeting was held on 25th August, at which Mr. B. F. Kaupp read a paper on what is sometimes known as "leg weakness" in poultry. It was pointed out that the condition was mainly due to constitutional weakness, and during the discussion the necessity of giving special attention to the birds in the breeding pens was emphasised as a means of preventing the trouble.

Glenorie.

A meeting was held on 28th July, when discussions took place on the prospects of the coming season, the marketing of fruit, and the high prices of manures.

Holbrook.

Thirty-five members of this branch journeyed to Wagga during August for the purpose of studying the various tests being conducted at the experiment farm. Eight motor cars carried the visitors with safety and comfort to the farm, where they were welcomed by the Manager, and then conducted by various officers over the farm. It was particularly explained by Mr. McKeown that the failures, about which something was heard at times, were actually demonstrations as such, and were deliberately undertaken to show farmers and others what could not be done, as well as what could be done. The sheep particularly interested the visitors. Some explained that it was a trick of the eye which made them appear so large and robust on the sides of the distant hills, but on closer inspection there proved to be no illusion about it. The finest of the sheep were Border Leicester x Merino cross. Other sires used were Lincoln and English Leicester. Ewes of the above crosses were mated on the farm to Dorset Horn rams, a flock of which were rounded up with 116 per cent. of June-drop lambs at foot. The experiments with sheep are conducted to encourage small owners to go in for fat-lamb breeding.

Kellyville.

The annual meeting and election of officers took place on 1st September. The secretary's report showed that there had been a fair attendance of members during the year, and that one meeting had been held for every month.

Lower Portland.

A meeting was held on 6th August, at which the annual report was read and the election of officers took place. The annual report showed that the membership stood at fifty-six, and that twelve meetings had been held during the year. The financial situation was satisfactory, and in addition to the lectures given by members of the branch and officers of the Department, the branch had held the first agricultural and horticultural exhibit at Lower Portland, and had secured second prize for a Bureau exhibit at the Hawkesbury District Agricultural Show.

Matcham.

A meeting was held on 1st September, which was attended by eighteen members. It was decided to stage an exhibit at next Gosford show, and arrangements were made for members who are familiar with such work to address the next meeting on the method of preparing an exhibit.

The date of the annual meeting was fixed for 27th October.

Meadow Flat.

A meeting was held on 1st September, at which a discussion took place on the suggested methods of dealing with Bathurst and Noogoora Burr pests.

Miranda.

This branch is holding a very interesting competition for poultry farmers, commencing on 1st October and ending on 30th June, 1918. Two prizes are to be awarded for the best kept poultry farms, which must be in the Shire of Sutherland, and maintain a stock of not less than 300 adult birds. An entrance fee of 5s. is charged to each competitor. The judge, who may be accompanied by stewards, is to have access to all competing farms without notice during the competition, and all farms will be finally inspected during the month of June, 1918.

The following score-card has been adopted :—

5 points for laying-out of farm for convenient handling of stock, not necessarily the largest or most expensive.

12 points for condition of fencing, houses, and yards, not necessarily the most expensive.

10 points for clean conditions of food preparation and for clean water supply.

20 points for clean conditions of houses and laying-boxes, and for freedom from vermin.

5 points for clean condition of yards and farm and provision of shade, litter not to be classed as dirt.

4 points for system under which stock is renewed.

10 points for system under which stock is separated.

6 points for system under which surplus males are prepared for market.

10 points for detection of producers and non-producers.

20 points for condition of whole of stock, not necessarily the largest stock.

Mittagong.

A meeting was held on 11th August, when it was decided to urge the Moss Vale show committee to institute a Bureau competition at the next show.

Mr. Gifford contributed a useful paper on his experiences with a new brooder house and brooder installed at the Mittagong Farm Homes last year.

Rawsonville.

Mr. R. G. May, Assistant Inspector of Agriculture, gave a lecture before this branch on 29th August, the subject being wheat cultivation.

St. John's Park.

A meeting was held on 17th August, which was attended by over twenty members. A lecture on chicken rearing was given by Mr. J. C. Scott, who in particular advocated raising only so many chickens in the spring as current profits from the laying birds would pay for. Should there be a failure owing to unforseen circumstances, there would then be only a limited loss, and not such a heavy one as would absorb the profits of the winter and early spring. Mr. Scott dealt with other aspects of the subject in an interesting and suggestive way.

Tallawang.

A meeting was held on 1st September, the proceedings being restricted to general business.

Tallong.

A meeting was held on 4th August, at which Mr. Mills, Fruit Inspector, read a paper on lime-sulphur spray and its use.

At a well-attended meeting on 22nd September, Mr. A. E. Davenport read a paper on spraying with arsenate of lead.

Tennyson (North Richmond).

A branch has been formed at Tennyson for which over twenty members have already been enrolled.

The following officers have been elected :—Chairman, Mr. L. H. Parker; Vice-Chairman, Mr. P. F. Wilmott; Treasurer, Mr. C. Penton; Hon. Secretary, Mr. J. E. Sweet.

Thyra—Bunaloo.

At a meeting of this branch on 25th August, a paper was read by Mr. T. Tomlinson on the best breed of farm horse. Mr. Tomlinson favoured the Clydesdale for the district, preferring it to the Shire because of the size, action, and smoothness of coat. A horse required to be fairly big to enable him to pull his load with comfort. He required action because of the nature of his work, and he should have a smooth coat to prevent excessive sweating. Such a horse would meet a ready sale in the market, providing he was not too old. With the contention that a heavy horse travelled better on ploughed land if he had a dash of the blood horse in him, this farmer did not agree, because it took a greater number of such horses to do the work, and because a farmer who carted his own wheat would find them lacking in strength to haul heavy loads.

Wetherill Park.

The annual meeting of this branch was held at Wetherill Park on 20th August. The following officers were elected :—Chairman, Mr. Clarke; Vice-Chairman, Mr. Bell ; Treasurer, Mr. Cotter; Hon. Secretary, Mr. A. J. Hodges.

Orchard Notes.

OCTOBER.

W. J. ALLEN.

Cultivation.

THE land should be worked with a cultivator as soon as it is in fit condition after rain. Frequent working assists in conserving moisture by preventing the caking of the surface and growth of weeds. The soil immediately beneath the trees that cannot be reached by the cultivator should be loosened and kept clear of weeds with a hoe. Whilst frequent stirring of the soil is necessary, it has to be borne in mind that at this season of the year thunderstorms may occur; provision should therefore be made for excessive surplus water to be carried away. A light plough furrow run through the rows of trees after cultivation will serve the purpose.

Young Trees.

Young trees may receive a mulch as an additional aid to conservation of moisture. Well rotted stable manure, straw, weeds, &c., are excellent materials for this purpose. The mulch should be placed just clear of the trunk, and be spread over the area not reached by the cultivating implements. It often happens that the stable manure, &c., used for this purpose is not thoroughly rotted, and an abundant growth of weeds springs up which, if not promptly dealt with, will quickly have the very opposite effect to that which was intended.

If the weather has been dry keep a strict watch on all newly-planted trees, and if they show any signs of wilting give them a couple of buckets of water from time to time till they are well established. This should be done by opening a deep furrow round the tree with a hoe or shovel and pouring the water into it. After it has soaked in, the furrow should be closed in again with dry soil.

In exposed positions it may be necessary to tie young trees to a stake to prevent them from being blown over. Such stakes should be short, so that their tops are below the crown of the tree, to avoid damage by rubbing.

Young trees growing under irrigation or other conditions where a heavy growth is assured may have the tips of the young shoots pinched when they have extended far enough. This not only lessens the liability of the shoots being blown out by heavy winds but also causes branching, and often two seasons' formation can be obtained in the one year. The time for this operation, of course, differs according to variety, some late-starting trees not being fit for it till November or early in December. It should be borne in mind that one takes risks in carrying out this practice except where one is certain of heavy growth, for if dry weather follows the operation the growth is stunted and less development is obtained than if the tree were left alone. Under all conditions, however, the growth of young trees requires close attention from spring till the latter part of summer.

Newly-planted trees should be disbudded, leaving four or five good shoots evenly spaced along the trunk. Do not allow two or three shoots to start in the same place, but give each a separate hold of the main stem, and if any shoots are outstripping the others they should be checked by pinching their growing points.

Trees planted from two to five seasons should also have the young shoots thinned out where necessary, and the stronger leaders checked to allow the weaker ones to catch up to them in growth. This thinning should not be too drastic. It is desirable to leave more shoots than are necessary for the future development of the tree, as there is always danger of some being blown out by heavy winds or meeting with some other accident. The superfluous growth is removed in the winter pruning.

Strong growths will often start in places not required; these should be suppressed at once, as there is a danger of them sapping the remainder of the branch.

Spraying.

Codlin Moth.—Spraying with arsenate of lead for codlin moth is compulsory, and growers should make the application in accordance with the regulations, copy of which was published in the Orchard Notes of the September, 1916, issue.

The exact time of application must be governed by the district in which the grower is located and the variety to be treated. Soft water should be used for diluting the arsenate of lead—rain water being most suitable.

In order that orchardists may be enabled to utilise many of the various brands of arsenate of lead at present on the market, the following table has been compiled by the Chemist's Branch, to which samples have been submitted for analysis:—

TABLE showing weight of various brands of lead arsenate paste to be taken in order that the resulting mixture shall contain as much dry lead arsenate as is equivalent to "18 oz. of arsenate of lead in the dry state to each 50 gallons of water."

Brand.	Weight to be taken.		Brand.	Weight to be taken.	
	lb.	oz.		lb.	oz.
Swift's	2	0	Hemmingway	2	0
Electro	1	11	Sherwin Williams	2	6
Foster's	2	11	Lewis Berger	2	0
Blue Bell	2	2	Federal	2	3
Red Seal	4	3	Austral	1	9
Nichol's or Our Jack ...	1	14	Carlton	2	5
Platypus	3	6	Vallo	1	14

The success of the method is unquestionable It has been proved time and again that those who spray systematically, bandage the trees, and pick up and destroy all fallen and infested fruit, succeed in harvesting over 90 per cent. of clean fruit.

Black Spot of Apples and Pears.—Where Black Spot of apples or pears is feared the trees should receive their second spraying of lime-sulphur or Bordeaux mixture (summer strength). Either of these sprays can be combined with arsenate of lead.

Black or Green Aphis.—These are liable to give trouble among peach trees, and occasionally amongst Japanese plums and apricot trees, this month. The trees should be sprayed with tobacco wash, a commercial tobacco extract, or a soap mixture, as soon as the pest makes its appearance. Give a drenching application at high pressure ; if any aphis are alive two days after, a second spraying should be given immediately to prevent the insects breeding in numbers again. Sometimes a third spraying is necessary.

Pear and Cherry Tree Slug.—Should this pest make its appearance the trees should be sprayed with arsenate of lead.

Oidium.—If moist weather prevails, grape vines should be dusted with flowers of sulphur to check oidium. Apply with an ordinary sulphur bellows or with a knapsack sulphur outfit.

Black Spot of Grape Vines.—Where this disease is prevalent, grape vines should receive a spraying of Bordeaux mixture (summer strength).

Vine Moth.—Where the larvæ of the vine moth are present, grape vines should be sprayed with arsenate of lead.

Lime-sulphur.

From the results of experiments with lime-sulphur for Black Spot of apple carried out by the Department, it has been decided that a weaker summer strength can be used for the control of this disease, the old summer strength being retained for the pinking stage (when the blossom buds are showing pink but while the petals of the earlier blossoms are still folded tight).

The following table gives the amount of water in gallons and quarts to be added to one gallon of concentrated lime-sulphur of varying strengths to give (A) winter strength of all deciduous trees ; (B) pinking strength of same ; (C) summer strength for apples and pears only ; (D) for citrus trees :—

Specific Gravity.	Degrees.		All deciduous Trees.				Apples and Pears only.*		Citrus Trees.	
	Baumé.	Twaddell.	A Winter strength.		B Pinking strength.		C Summer strength.		D	
			gal.	pts.	gal.	pts.	gal.	pts.	gal.	pts.
1·162	20	32·4	5	3	21	2	28	0	15	6
1·171	21	34·2	5	6	22	3	29	5	16	5
1·180	22	36·0	6	0	23	5	31	2	17	4
1·190	23	38·0	6	4	25	0	33	0	18	5
1·200	24	40·0	6	7	26	3	34	7	19	5
1·210	25	42·0	7	2	27	6	36	5	20	5
1·220	26	44·0	7	5	29	1	38	3	21	5
1·231	27	46·2	8	1	30	5	40	3	22	7
1·241	28	48·2	8	4	32	0	42	1	23	7
1·252	29	50·4	8	7	33	4	44	1	25	0
1·263	30	52·6	9	3	35	0	46	1	26	1
1·274	31	54·8	9	6	36	4	48	1	27	2
1·285	32	57·0	10	3	38	0	50	0	28	3
1·297	33	59·4	10	6	39	5	52	2	29	5
1·308	34	61·6	11	1	41	2	54	1	30	6
1·320	35	64·0	11	5	42	7	56	3	32	0

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* Unfortunately, experiments have proved that no summer strength can be fixed for stone fruits that is safe under all conditions.

Miscible Oils.

There are indications that owing to war conditions some of the raw material from which miscible oils are made is not so uniform in character as formerly, and the resulting product is not therefore giving the same reliable results.

Irrigation.

The irrigation season commences this month See that furrows are well made, and that they are deep rather than shallow. While irrigating, see that no water is allowed to flow over the surface of the soil, or to lodge around the trunks of trees. When watering, give the land a good soaking, taking care to see that the water reaches the roots of all young trees and vines. Immediately the ground is dry enough to work, it should be worked to a good depth with suitable implements; the soil in the immediate vicinity of trees and vines should also be well worked with a forked hoe.

Dormant Buds and Grafts.

Keep all worked stock well disbudded ; never allow suckers to grow where either bud or graft is doing well. But if the buds or grafts have failed, shoots should be allowed to start from the stumps. These can be budded later. If the stocks on which buds were inserted have not been cut back, this should be done without further delay. The cut should be slanting, being slightly lower on the side opposite the bud ; and it is advisable to stake them, not only to prevent their being blown out, but also to encourage a straight trunk.

Thinning.

The stone and pome fruit crop should be thinned where heavy crops have set. It is advisable, however, to delay this operation till the natural drop (when the seed is hardening) has finished. In thinning, one should remove damaged fruits, twins and malformations, thus ensuring a better grade of fruit for market. The amount of fruit removed is determined by varieties, age of tree, whether irrigation is practised or not, and other conditions under which the tree is growing.

Harvesting.

Oranges are not hanging too well in some districts this season. Where this is the case they should be harvested without delay. The fruit should be graded and firmly packed in rows.

PROBLEMS IN GRAFTING.

A CORRESPONDENT recently asked—(1) Is it advisable to graft scions off almond seedlings on to another almond seedling to prevent bitterness in flavour of the kernel ? (2) At what time is it best to graft grape vines, and how can cuttings or scions be kept for grafting?

In reply, the Fruit Expert stated in connection with (1) that he would not recommend grafting scions of an almond seedling on to another almond seedling. It would be better to procure one of the many proven varieties which produce good, sweet nuts, any of which might be grafted on to the tree referred to.

As regards (2), he stated that the best time to graft grape vines is when the buds are well swollen. The cuttings, as soon as made, should be buried in the ground in a cool, shady, and fairly dry place.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1917.

Society.	Secretary.	Date.
Junee P., A., and I. Association	T. C. Humphreys..	Oct. 2, 3
Ardlethan P. and A. Society	W. J. Nixon ...	,, 3
Deniliquin P. and A. Society	P. Fagan	,, 3
Millthorpe A. and P. Association	C. J. E. Hawken	,, 10
Hay P. and A. Association	G. S. Camden ...	,, 10, 11
Carcoar H. C. and A. Association	J. L. Howarth ...	,, 17
Tweed River A. Society	T. M. Kennedy ...	Nov. 7, 8

1918.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	H. G. Fraser ...	Jan. 30, 31
Berry Agricultural Association	A. McConaghy ...	Feb. 6, 7
Dapto A. and H. Society	J. J. Cook ...	,, 20, 21
Guyra P., A., and H. Association	P. N. Stevenson...	,, 20, 21
Alstonville A. Society	C. D. McIntyre ...	,, 26, 27
Yanco Irrigation Area A. Society	F. E. Harrison ...	,, 26, 27
Bangalow A. and I. Society	W. H. Reading ...	,, 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent ...	,, 26, 27, 28
Moruya A. and P. Society	H. P. Jeffery ...	,, 27, 28
Dorrigo and Guy Fawkes A. Association	R. R. Blair ...	,, 27, 28
Newcastle A., H., and I. Association	E. J. Dann ...	,, 27, 28; March 1, 2
Tenterfield P., A., and M. Society	R. G. White ...	Mar. 5, 6, 7
Braidwood P., A., and H. Association	L. Chapman ...	,, 6, 7
Tumut A. and P. Association	T. E. Wilkinson...	,, 6, 7
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne ...	,, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy ...	,, 7, 8
Glen Innes & Central New England P. & A. Assocn. ...	G. A. Priest ...	,, 12, 13, 14
Cobargo A., P., and H. Society	T. F. Kennelly ...	,, 13, 14
Bombala Exhibition Society	P. J. Jonas ...	,, 13, 14
Tumbarumba and Upper Murray P. and A. Society...	W. R. Figures ...	,, 13, 14
Camden A., H., and I. Society	A. E. Baldock ...	,, 13, 14, 15
Goulburn A., P., and H. Society	R. C. Fraser ...	,, 14, 15, 16
Cooma P. and A. Association	C. J. Walmsley ...	,, 20, 21
Gundagai P. and A. Society	C. D. Asprey ...	,, 20, 21
Macleay A., H., and I. Association (Kempsey) ...	E. Weeks... ...	,, 20, 21, 22
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins ...	,, 20, 21, 22
Bathurst A., H., and P. Association	S. V. Turrell ...	April 10, 11, 12
Hunter River A. and H. Association (West Maitland)	E. H. Fountain ...	,, 10-13
Upper Manning A. and H. Association (Wingham)...	D. Stewart ...	,, 17, 18
Batlow Agricultural Society	C. S. Gregory ...	,, 23, 24
Dungog A. and H. Association	W. H. Green ...	,, 24, 25

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Agricultural Gazette of New South Wales.

Water on the Farm.

F. B. GUTHRIE.

WATER is used on the farm for the following principal purposes :—

(*a*) For human consumption.
(*b*) For household purposes.
(*c*) For irrigation.
(*d*) For watering stock.
(*e*) For steam boilers.

It is required, in addition, for special purposes and operations, such as butter-making, wool-washing, tanning, and similar industrial operations which are sometimes carried out on the farm. Speaking generally, the principal uses to which it is put are those enumerated above.

Before discussing more particularly the kind of water best suited for these different purposes, it will be desirable to obtain some idea of the sources of the water at the farmer's disposal, and the nature and composition of the different supplies. These may be classified conveniently as follows :—

Rain.
Springs and wells.
Streams and rivers.
Ponds and lakes.
Artesian and sub-artesian bores.

The types of water derived from these various sources differ from each other in the amount and nature of the impurities they contain, whether those impurities are derived from the mineral or from the organic matter with which the water has been in contact. It is upon the amount and nature of this contamination that their suitability or otherwise for different agricultural purposes depends. It will, therefore, be useful to discuss, in the first place, the characteristics and properties of these different types of water. Sea-water and medicinal or highly carbonated waters, will be omitted from the discussion.

Rain-water.

Rain is the original source of all the different types of water met with in nature. Rain-water is the purest form of water occurring in nature, and is the nearest approach to distilled water, which is the purest water obtainable. Rain-water is, in fact, naturally distilled water—the vapour rising from land and water surfaces collecting under certain atmospheric conditions into clouds, and being precipitated as rain or snow or hail. Evaporation from land and water surfaces is continually going on, so that the air is always more or less humid, although the water-vapour present is invisible.

The air can, however, only contain a certain proportion of water-vapour. This proportion varies according to the temperature of the atmosphere and the pressure exerted by the water vapour. In other words, when air which is saturated with moisture at a given temperature is cooled below that temperature, it can no longer hold that quantity of moisture, and the excess is condensed in the form of mists or clouds. This point is known as the "saturation point." If these clouds pass into drier atmospheric strata or are kept up by ascending currents, no rain is formed. If, however, the cooling process continues, condensation proceeds further and rain is formed. That is a reason why rainfall is usually abundant in mountainous districts, the lower temperatures of the mountain summits cooling the warm, damp air below its saturation point.

Impurities in Rain-water.

Even rain-water, however, always contains small but appreciable quantities of impurities, which it has taken up in its passage through the atmosphere. In rain-water falling in open country inland these impurities are practically confined to the gases, oxygen, nitrogen, and carbonic acid (which are dissolved by water in small proportions), to traces of organic matter such as are always present in the air, and to traces of saline matter. In the neighbourhood of the sea, the amount of saline matter in the atmosphere and which is brought down by the rain, and especially the sodium chloride (common salt) increases considerably. Moreover, certain salts, such as iodides and bromides, which are not found in rain-water falling inland, are found in appreciable quantities in the neighbourhood of the coast.

In rain that falls in towns or centres of population, the amount of organic matter and ammonia increases considerably; and in the neighbourhood of towns where manufacturing industries are carried on, the saline matter in the atmosphere becomes greater, and acid vapours, such as sulphurous acid, hydrochloric acid, and sulphuretted hydrogen are generally present.

Rain-water which is highly charged with organic matter is liable to undergo decomposition on being stored, and, on the other hand, when charged with acids it is likely to corrode vessels in which it is kept.

The following tables exhibit the nature of rain-water, and of the impurities to be expected in inland and coastal localities. I am indebted to Dr. T. Cooksey, Government Analyst, Department of Public Health, for permission to make use of them.

ANALYSES of Samples of Rain-water collected from Tanks on Tableland.

Chemical Characters.	Muswellbrook. Taken 20th Sept., 1912.	Tenterfield. Taken 16th May, 1913.	Glen Innes. Taken 6th Dec., 1913.	Glen Innes. Taken 5th May, 1914.	Inverell. Taken 30th Mar., 1914.	Manilla. Taken 28th Feb., 1914.
	Parts per 100,000.	Parts per 100,000.	Parts per 100,000.	Parts per 100,000.	Parts per 100,000.	Parts per 100,000.
Total Solid Residue	3·6	0·3	1·1	1·0	3·0	1·3
Chlorine as Chlorides ..	0·25	0·10	0·10	0·08	0·08	0·10
Free and Saline Ammonia ..	0·000	0·000	0·002	0·004	0·006	0·006
Organic Ammonia	0·004	0·006	0·004	0·003	0·009	0·006
Nitrogen as Nitrites	0·000	0·000	0·000	0·000	0·000	0·0005
,, Nitrates	0·023	0·023	0·024	0·015	0·016	0·016
Oxygen absorbed in 15 mins.	0·012	0·020	0·022	0·018	0·046	0·016
,, ,, 4 hours	0·026	0·040	0·044	0·034	0·090	0·040

All these waters were contaminated with zinc, but the amounts of zinc carbonate present are not included in the total solids shown above.

Analyses of Samples of Rain-water collected from Tanks in Coastal Districts.

Chemical Characters.	Kempsey. Taken 31st Jan., 1913.	Murwillumbah Taken 21st Feb., 1914.	Casino. Taken 21st Dec., 1915.	Richmond. Taken 2nd Feb., 1916.	Richmond. Taken 2nd Feb., 1916.
	Parts per 100,000.	Parts per 100,000.	Parts per 100,000.	Parts per 100,000.	Parts per 100,000.
Total Solid Residue	4·0	2·6	0·9	4·7	4·2
Chlorine as Chlorides	0·48	0·60	0·5	1·3	0·9
Free and Saline Ammonia ..	0·002	0·008	0·013	0·031	0·094
Organic Ammonia	0·006	0·003	0·010	0·012	0·009
Nitrogen as Nitrites	0·000	0·000	Trace	0·000	0·001
,, Nitrates	0·048	0·024	0·015	0·028	0·017
Oxygen absorbed in 15 minutes	0·038	0·012	0·030	0·034	0·046
,, ,, 4 hours ..	0·068	0·026	0·062	0·072	0·096

All these waters were contaminated with zinc, but the amounts of zinc carbonate present are not included in the total solids shown above.

We have, unfortunately, no records of analyses of rain-water falling in urban industrial centres, but the following, taken from analyses by Angus Smith, and generally quoted, will give some idea of the contamination likely to be met with under such conditions.

	In parts per 100,000.		
	Free Acid (as Sulphuric Acid).	Ammonia.	Nitrates.
12 Inland country places (England) ...	0·	0·107	0·075
Glasgow	1·5	0·91	0·244

For the sake of contrast and comparison, the mineral contents of sea-water are given below, as representing the extreme of saline content met with in nature.

Saline residue from rain-water falling in open country inland (see preceding table) ...	1·7 parts per 100,000 parts.
Water of Pacific Ocean	3,123· „ 100,000 ,,

The waters of certain inland lakes, which possess no outlet and act as huge evaporating basins, contain a still larger and constantly increasing proportion of saline matter. For example, the water of the Dead Sea contains 22,857 parts per 100,000; and that of the Elton Lake, in South Russia, contains 27,143 parts per 100,000.

Rain-water is, then, not only the purest form of water met with in nature, but the source of all the various kinds of water available. All the other types of water differ from rain-water in the fact that they have been in contact with the earth for a longer or shorter period of time, and contain in consequence greater or smaller proportions of saline or organic matter derived from that source.

Solvent Power of Water.

Water possesses a higher solvent power than any other liquid occurring in nature. As soon as rain-water falls on the earth it at once exerts its solvent power, dissolving mineral matter as it flows over the surface or percolates into the depths. There are, therefore, no special features that distinguish spring, river, and well waters, since their composition will vary according to the length of time the water has been in contact with the earth, and even more according to the nature of the geological formations through which it has percolated.

It may, however, be taken as a general rule that the following is the order of purity for the types of water occurring in nature:—

(1) Rain.
(2) Streams and rivers.
(3) Springs.
(4) Shallow wells.
(5) Deep wells.

Spring and Well Water.

When rain falls on the earth's surface, it either sinks in, or runs over the surface, or collects in pools. Of that which runs over the surface or collects in pools, part is evaporated into the air and part gradually sinks. Except for the comparatively small proportion which is evaporated, practically all the water brought down as rain sinks through the pores in the soil or cracks and fissures in the rocks until it is arrested by an impervious stratum of rock, where it collects, forming subterranean pools. This underground reservoir feeds the springs and wells, and is known as ground-water. The amount of ground-water present is, therefore, not always dependent on the rainfall in any particular spot, as the ground-water may flow underground from some other place. This is well shown in the artesian area of the State.

The rocks on the surface are more or less porous, especially where they have been exposed to weathering, and on this account water penetrates them slowly. Penetration is more rapid through the cracks and fissures always present.

The level at which this ground-water lies, and at which a permanent reservoir exists, is known as the water-table, and varies considerably under different circumstances. In some cases it may be a few feet below the earth's surface; in others, 100 feet or more. It is deepest in dry regions. In flat country the depth of the water-table is fairly uniform, in undulating country it follows the contour of the surface, though not uniformly.

This underground reservoir is the source of spring and well waters, and wells must be sunk to this level if a permanent supply is to be assured. Probably nearly all the ground-water comes to the surface again as springs or wells. A small proportion enters into chemical combination with the minerals of which the rocks consist, as in the case of oxide of iron.

A spring is water issuing through a natural opening in quantity sufficient to form a current; springs only occur where there are natural passage ways for the ground-water to escape to the surface. These passages may extend far below the surface and tap the ground-water at a considerable depth, or, in other cases, the water may flow through a porous layer over an impervious one and finally emerge at the surface as a spring in another place. In either case the point of emergence must be lower than the intake.

Varying Composition of Spring Water.

The difference in the composition of the water in such springs or wells depends upon the solvent action of the ground-water. This solvent action is considerably increased by reason of the fact that even the purest rain-water contains carbonic acid and oxygen gases in solution, and the long-continued action of water on rocks plays a considerable part in their conversion into soil. When the water passes first through a layer of soil, it becomes charged, in addition, with organic matter containing soil acids, which enormously increases the solvent action of the water on the underlying rocks.

The content of carbonic acid is also increased in these processes, and in cases where the water has to traverse limestone formations the amount of dissolved carbonic acid taken up is often considerable, and the disintegrating action of the water and its power of dissolving matter from the rocks are greatly increased. Such waters are often so highly charged with carbonic acid under the pressure to which they are subjected in the underground reservoirs, that when the pressure is released by sinking a well or putting down a bore the excess of carbonic acid escapes and gives the phenomenon of effervescent mineral waters.

The nature of such waters depends chiefly upon the nature of the soil or rock through which they have passed. Water derived from granite is usually purer than that which has percolated secondary strata. The latter is generally more or less calcareous, especially that from limestone. In some cases, as we shall see, such waters may contain so much lime as to be too hard for ordinary domestic purposes.

The water of shallow wells often smells strongly of sulphuretted hydrogen. This is due to the reduction of the sulphate of lime present by the organic matter derived from the soil. Calcium sulphide is formed, which, in contact with water, evolves the objectionable odour of sulphuretted hydrogen. Such waters also generally contain nitrates and nitrites from the oxidation of organic matter containing nitrogen. The impurities in surface springs and shallow wells are derived from the gathering-ground of the subsoil water at points above the level of the spring, and their nature will depend upon the nature of the soil in these localities. The water of deep springs and deep wells ascends from greater depths, having passed, as a rule, through different strata, on the varying composition of which its character will depend.

Running Waters (Streams and Rivers).

On issuing in the form of springs the water pursues its way over the surface of the earth, wearing channels for itself, and forming streams and rivers. The action is, at first at all events, principally a mechanical one, the water carrying away little by little the particles of soil and rock over which it runs in forcing a passage for itself.

As it issues in springs the water, as we have seen, is charged with a varying amount of saline matter, as well as carbonic acid which holds certain salts in solution. On emergence the carbonic acid escapes and the saline matter (especially carbonates of lime, iron, and magnesia) is liberated from solution and deposited in the soil. The soil also acts as a filtering medium, and has the power of absorbing salts filtering through it. The fact that the principal solvent agent, the carbonic acid, has escaped further reduces the solvent power of the water, so that the stream gradually parts with a portion of the saline material brought up from below, and the proportion of saline material present diminishes as the distance from the original spring increases. If the spring rises through granitic rocks and flows over sandy soil, the amount of saline matter held in solution in the stream or brook will be very small.

The water in streams and rivers nevertheless still exercises a considerable solvent action. Although its erosive action is mainly of a mechanical nature, removing particles of soil and rock in its passage, this detritus is carried along by the stream, and in the more swiftly-moving brooks and torrents it becomes ground to an impalpable powder or sludge, and the solvent action of the water takes from it the more readily-dissolved saline material, particularly chlorides and salts of potassium and sodium. Rain also, which, as we have seen, contains carbonic acid gas, when falling into streams and rivers increases the solvent action of the water by renewing the supply of that ingredient. In times of flood, too, rivers carry away from the surface a considerable amount of soil in a very fine state of division, from which a certain quantity of salts is leached. The bulk of this suspended matter, however, is simply carried away and deposited in another place.

Running streams also contain a larger proportion of dissolved oxygen or air than spring-water, which contains practically no oxygen. In a swiftly flowing stream the water becomes thoroughly aerated by being churned up with air when dashed against rocks and other obstacles.

River water nearly always carries a certain amount of suspended matter which renders it turbid; especially is this true of rivers passing through arable country. This suspended matter consists chiefly of organic matter, together with finely-divided sand and clay.

The water of rivers is liable to changes, which are frequently considerable and sudden, due principally to variation in the rate of sedimentation, brought about by floods or the action of tributary streams. These changes affect not only the nature of the suspended matter, but also the saline matter and the organic matter and micro-organisms. Variations also occur at different depths and at different localities.

(*To be continued.*)

WAR CHEST DAY, 28TH SEPTEMBER, 1917.

THE Village Fair organised by the women of the Public Service in connection with War Chest Day proved a great success, and the representatives from the Department of Agriculture who had charge of the Produce Stall desire to thank the merchants and others who responded so generously to the appeal for produce in the September issue of the *Agricultural Gazette.*

Popular Descriptions of Grasses.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE BROME GRASSES.

THE Brome grasses are mostly native to the north temperate regions of the globe. In the course of time, and as settlement has extended over America, South Africa, New Zealand, and Australia, some species of these grasses have become introduced into these countries, and are now widely distributed. The capacity of this genus to spread is considerably assisted by the structure of the seed, which is large and capable of easy germination.

The structure of the Brome grasses can be readily imagined from a typical Brome grass that is known to all, viz., Prairie grass (*Bromus unioloides*). The seed-heads or spikelets consist of several flowers overlapping each other. The outer grain-sheath or glume is large, two-pointed at the apex, and with a fine bristle or awn projecting from this apex.

The Brome grasses may be classified, according to their usefulness, as follows. The list does not include all the varieties found in the State, but only those fairly common :—

(1) Useless Brome grasses—
  Sterile Brome grass (*Bromus sterilis*).
  Soft Brome grass (*Bromus mollis*).
  Great Brome or Broncho grass (*Bromus maximus*).
  Bromus racemosus.

(2) Of limited use—
  Bromus secalinus.

(3) Useful Brome grasses—
  Prairie grass (*Bromus unioloides*).
  Awnless Brome grass (*Bromus inermis*).

It will be convenient to deal with the useless Brome grasses first.

Useless Brome Grasses.

All the useless Brome grasses in their early stages present a fine green appearance, and, to a certain extent, convey to the pastoralist a false impression of their value. Sheep will certainly eat them in their young stages, but the nutritive value, even at that period, is very low. When their short-lived habit is considered, and also the fact that they are crowding out the native grasses at a time when the latter should be making an appearance, they must all be reckoned to be detrimental to our pastures.

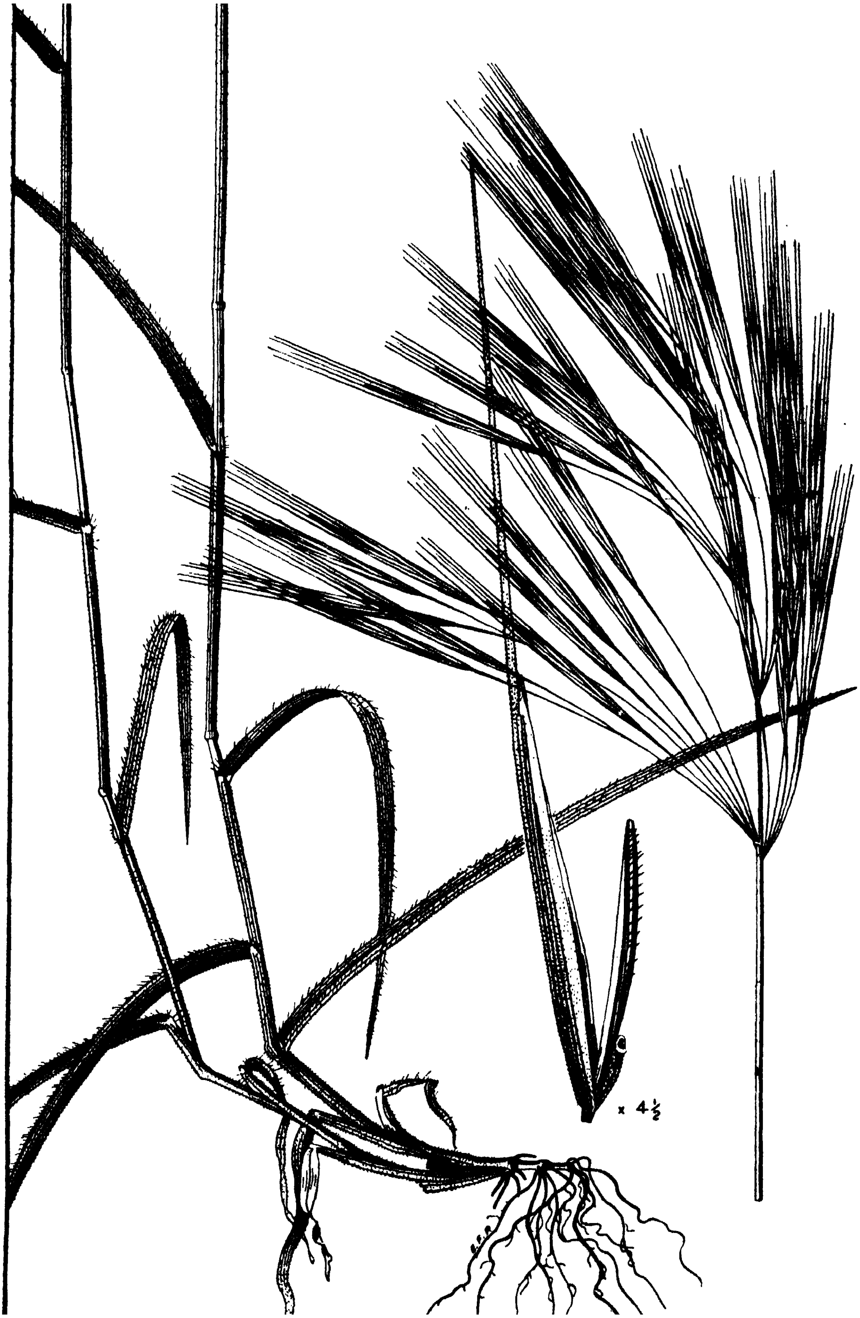


Fig. 1.—Sterile Brome Grass (*Bromus sterilis*).
Note the comparatively small flowering glume

POPULAR DESCRIPTIONS OF GRASSES.

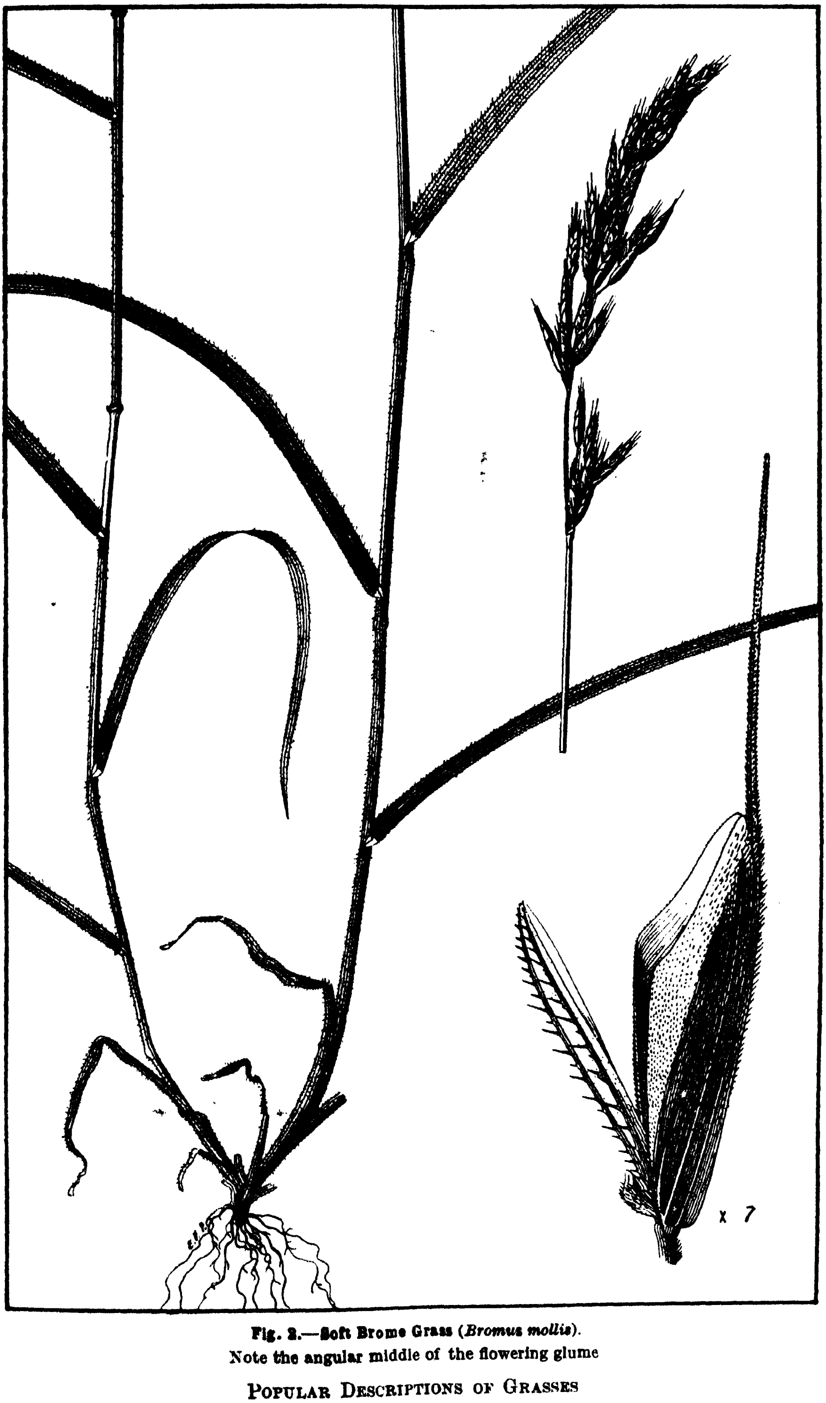


Fig. 2.—Soft Brome Grass (*Bromus mollis*).
Note the angular middle of the flowering glume

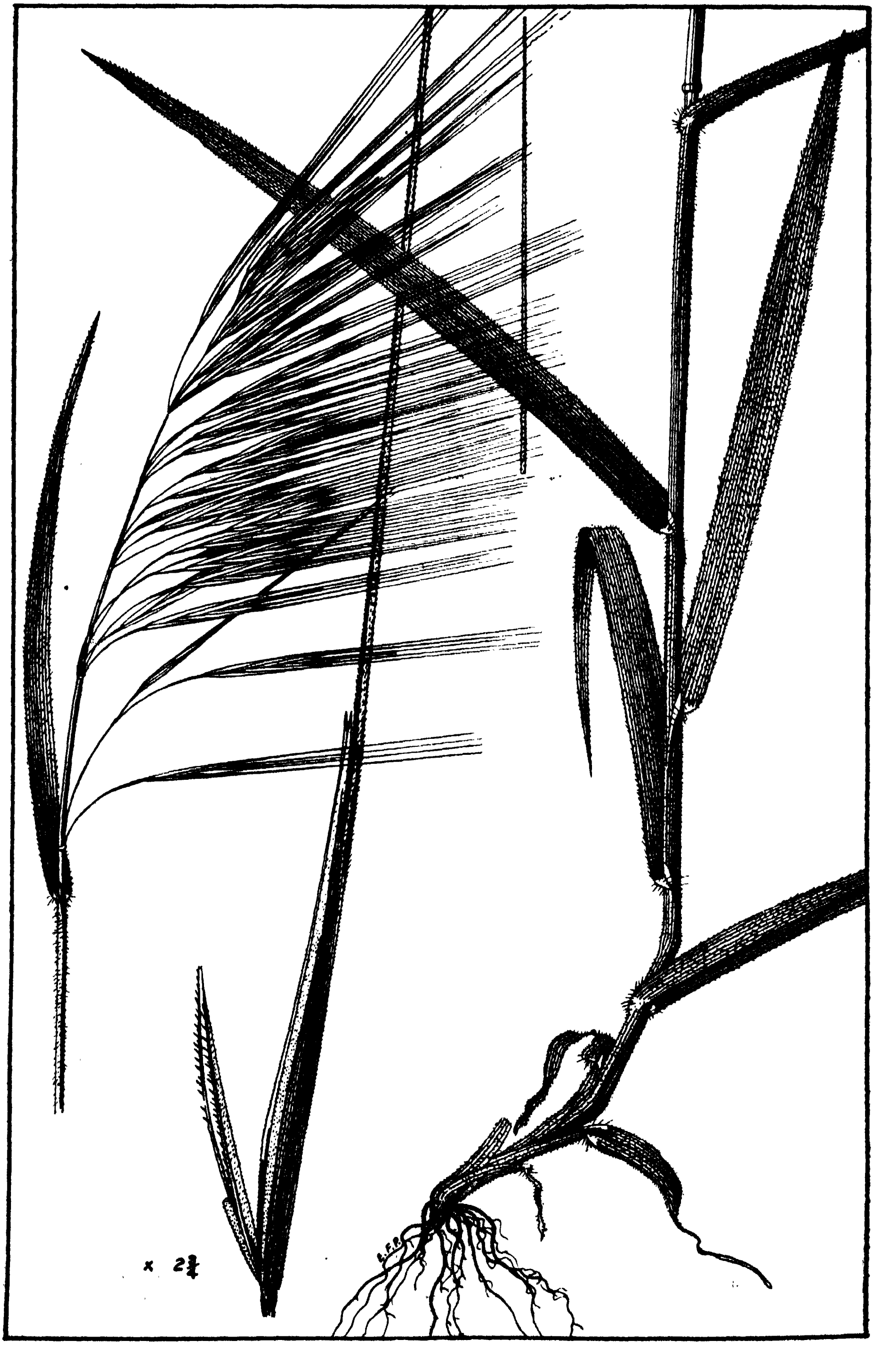


Fig. 8.—Great Brome or Broncho Grass (*Bromus maximus*).
Note the large flowering glume.

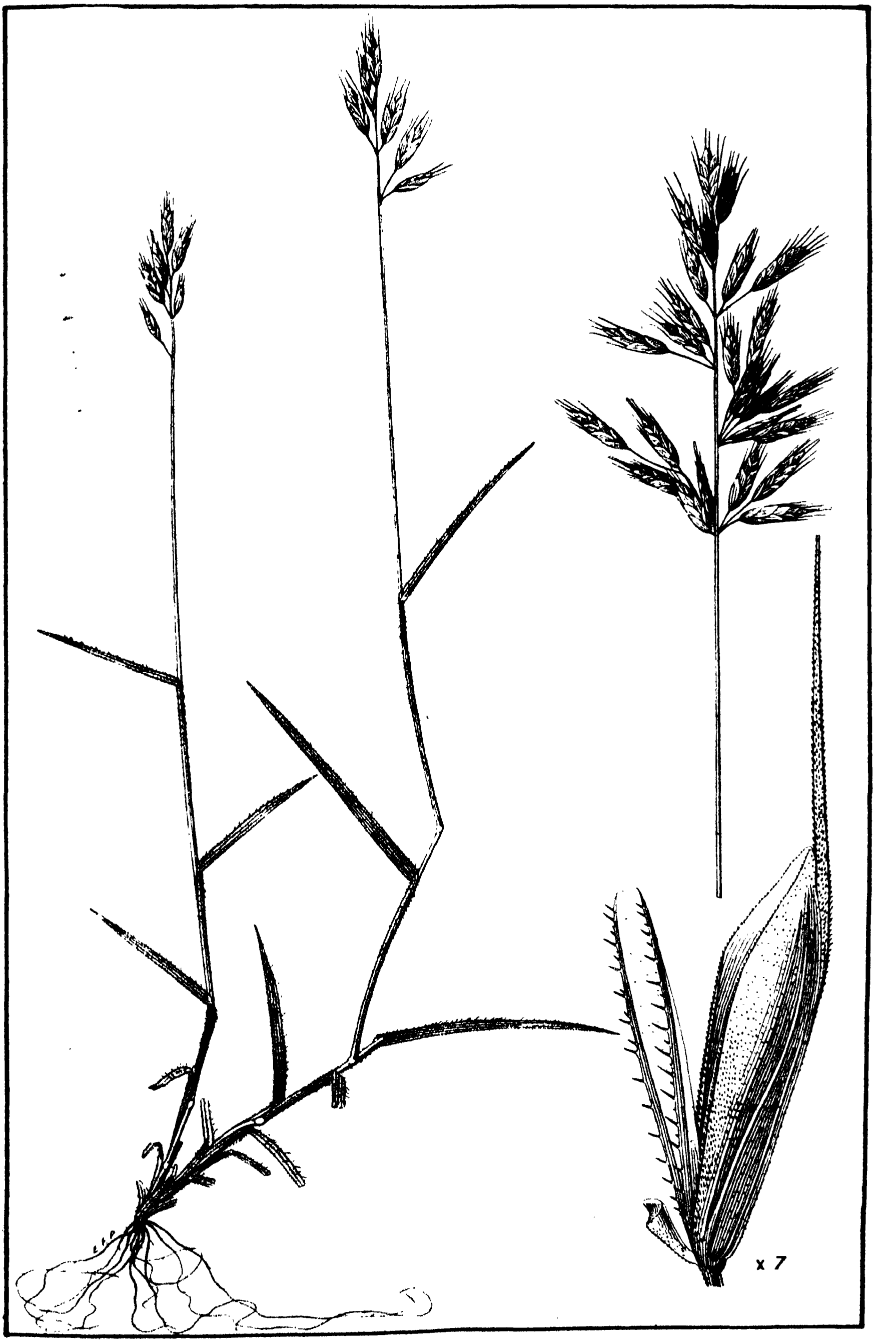


Fig. 4.—*Bromus racemosus.*
Note the curved middle of the flowering glume.

POPULAR DESCRIPTIONS OF GRASSES.

STERILE BROME GRASS (*Bromus sterilis*).—This is an annual introduced grass, whose native home is Europe generally. It has rather roughish stems, with slightly hairy leaf-sheaths and leaves. The flower stems are generally weak, and the whole flower-head, usually consisting of seven to twenty flowers, is drooping.

This is a very common grass in the pastures of the Coast, Tablelands, and Slopes. In the Riverina and South-western Slopes particularly it is a common sight during the spring months, both on fallowed lands and in native pastures.

There is no doubt that this grass, together with the other useless Bromo grasses where they occur, gives the pastures a very verdant appearance for a short period, but it is of a hairy, non-succulent type on which stock cannot possibly thrive. Moreover, it is short-lived, and disappears on the first approach of hot weather, but seeding heavily to ensure its reproduction more abundantly than ever the following spring.

SOFT BROME GRASS (*Bromus mollis*).—This is another annual Brome grass introduced from Europe into Australia. It can be regularly distinguished amongst the Brome grasses by the general hairiness of the stems, leaves, and flowers. The structure of the flowering or seed-heads is somewhat akin to that of *Bromus racemosus*, but the hairiness is always a distinguishing feature.

Soft Brome grass grows well on poor grass lands, but is also very common in wheat fields and fallowed paddocks in the interior. It has a spindly habit, with little flag—and that unpalatable. Its growth lasts through the spring and well into the summer. It seeds heavily, and, because of the high viability of the seed, it reproduces itself readily the following year, and thus becomes a common annual weed, possessing no redeeming feature whatever.

BRONCHO GRASS OR GREAT BROME GRASS (*Bromus maximus*).—This is another annual grass, introduced from Europe probably about the same time as *Bromus sterilis*, to which it is somewhat similar in appearance, but from which it can be distinguished by the flowering stalks, which are soft to the touch, whereas in *Bromus sterilis* they are rough. There are also differences in the flowering glumes, which are shown in the accompanying figures.

As far as habitat is concerned, practically the same remarks apply to this grass as to *Bromus sterilis*; and the two grasses are commonly seen growing in association.

Bromus racemosus.—This is also an annual and an introduction. It is somewhat similar to *Bromus mollis*, but, unlike that variety, it has no hairiness developed on the flower-heads.

It is very abundant in the southern districts during the spring months, and is gaining fresh ground every year, gradually tending to choke out our finer pasture grasses. It can often be found growing in association with the other useless Brome grasses previously mentioned. It is considered of no agricultural or pastoral value in Europe, and the same remark applies to it as far as this State is concerned.

(*To be continued.*)

Farmers' Experiment Plots.

POTATO EXPERIMENTS, 1916-17.

NORTHERN DISTRICTS.

R. W. McDIARMID, Assistant Inspector of Agriculture.

DURING the season 1916-17 six experiments were conducted by this Department in conjunction with the undermentioned farmers:—

Mr. J. F. Chick, "Hill View," Tenterfield.
Mr. T. Farlow, "Mayfield," Red Range.
Mr. William Moore, senior, Guyra.
Mr. S. Collins, "Rose Valley," Black Mountain.
Mr. L. M. Rixon, "Mahemorilake," Uralla.
Merton Model Farm, Denman.

The experiments comprised variety and manurial trials, and were conducted on a uniform plan throughout. The area sown at the various places ranged from half an acre at Denman to one and one-half acres at Guyra.

The Season.

The season experienced throughout the whole of the north was the wettest for many years, with insufficient warm days in New England for the most successful growth of potatoes. The yields on the Tenterfield and Denman plots could scarcely have been better. The plots at Denman were originally intended to be conducted under irrigation conditions, but artificial irrigation was totally unnecessary. In the districts of Black Mountain, Guyra, and Red Range the rainfall was excessive until the end of January, when the opposite conditions prevailed, resulting in an inferior growth of tubers, particularly at Black Mountain.

Soil and Cultural Notes.

Tenterfield.—The soil here was representative of the district, being a light loamy soil derived from granite, and of fair fertility. The previous crop was maize fertilised with 1 cwt. superphosphate per acre. The first ploughing was done early in August, and the soil was then left until the first week of September, when the spring-tooth cultivator was run over it once. Later it was rolled and harrowed, leaving a splendid seed-bed. The potatoes were ploughed in on 5th October at the rate of 10 to 12 cwt. per acre, with 3 cwt. per acre of the fertiliser mixture P4 (which is composed of 4 parts sulphate of ammonia, 13 parts superphosphate, and 3 parts sulphate of potash). The seed mostly consisted of whole potatoes, dropped 16 inches apart in rows 3 feet apart, and covered 5 inches deep. The strike throughout could not have been better, and the early growth was not checked until 6th January, when a severe hail-storm cut the leaves off and severely damaged the stalks. The tubers were well formed at that stage, but there is no doubt better yields would have been harvested had not this hail-storm occurred. The rainfall during the growing months was as follows:—October, 353 points; November, 365 points; December, 355 points; January, 680 points; February, 365 points; total, 21·18 inches.

Red Range.—The plots were established 9 miles from Glen Innes, on the main road to Red Range. The land was cropped for the second time, the previous crop having been potatoes manured with 3 cwt. per acre of P4 mixture. It was a fairly deep, rich, volcanic soil, with a slight slope towards the east. The first ploughing was given in June, and the second in October; then the land was twice spring-tooth harrowed. The sowing was at the rate of 10 to 12 cwt. per acre of mostly whole seed, together with 3 cwt. per acre of P4 mixture. The sets were dropped 16 inches apart in rows 3 feet apart, and covered 5 inches deep. The seed was sown on 6th and 7th November. The germination was good throughout, except in the case of the Up-to-Date variety, the seed of which was somewhat inferior. The plots suffered from excessive rains during the first three months, and then a dry spell followed. The yields were reduced somewhat by the presence of dry-rot, and possibly of a little blight. The record of rainfall was not available at or near these plots.

Guyra.—The soil at Guyra consists of rich red volcanic loam, which has been cropped to potatoes for some years. The previous crop was potatoes grown without any artificial fertiliser. These were not harvested until October, thus delaying the preparation of the land for the plots. The land was ploughed and harrowed in the middle of October, and again ploughed at planting time on 2nd November. The plots were manured with 3 cwt. of P4 mixture throughout the variety trial, and the seed was sown at the rate of 10 cwt. per acre. The strike was very good throughout the plots, and the subsequent growth was also good, though hindered by excessive rains. As frequently happens at Guyra, the early-maturing varieties did not yield nearly so well as the late-maturing ones. The rainfall recorded at the post office, about two miles from the plots, was as follows:—November, 565 points; December, 578 points; January, 739 points; February, 432 points; March, 208 points; total, 24·22 inches.

Black Mountain.—The land used for the experiments at Black Mountain was a light loamy soil that usually responds well to the use of artificial fertiliser. It was cropped with oats (unmanured) the previous year. Owing to the very wet season experienced it was difficult to prepare this land early, and consequently it was only ploughed just prior to sowing. The seeding was done by machine in 3-feet rows, using 10 cwt. of seed per acre. At the same time 3 cwt. per acre of P4 mixture was applied. The seed struck well, but growth was slow during the very wet months, and from flowering time onwards very little rain fell. The resulting crop was very light, and the potatoes were mostly inferior. The record of rainfall was not available in the vicinity of the plots.

Uralla.—The land utilised had previously carried one crop of potatoes only. The soil was deep, fairly loamy, derived from granite and ironstone formations. Ploughing was done in July, and again at planting time. The seed was dropped 16 inches apart in 3-feet rows, together with 3 cwt. per acre of P4 mixture. The germination was good, but subsequent growth was somewhat interfered with by the excessive weed growth, which could not be checked owing to continued wet weather. The rainfall amounted to:—November, 385 points; December, 695 points; January, 513 points; February, 259 points; March, 46 points; total, 18·98 inches.

Denman.—The plots here were situated on the rich alluvial river flats, though perhaps a little more sandy where the plots were located than is the case with the bulk of this land in the district. It had been fallowed during 1915 and occasionally worked, and was ploughed in June and August of 1916 for the experiments. It was disc-harrowed on 26th August, and rolled on 31st August. Sowing took place by ploughing in on 31st August, and harrowing afterwards. Only early-maturing varieties were used, and they were sown without manure. The seeding was at about the rate of 10 cwt. per acre, being in 3-feet rows, with sets 18 inches apart in the rows. Provision was made for irrigation, if necessary, but the rainfall was sufficient. The rainfall during the growing period amounted to:—September, 136 points; October, 300 points; November, 251 points; December, 397 points; total, 10·84 inches.

The Variety Trials.

The variety trials in the New England districts comprised the same varieties, and were fertilised uniformly throughout. At Guyra four additional varieties were tried, and at Uralla one extra. The Denman plots consisted of four early-maturing varieties only, and were grown without the aid of artificial fertiliser.

The individual yields are given in the accompanying tables, a careful study of which shows Manhattan variety to be the most consistent yielder, and that the P4 mixture gave the highest average in the manurial trials. In the New England plots the most successful varieties have again been the late-maturing ones, and the first six varieties in Table A are the same as occupied the first six places the previous year, the only difference in order being that Manhattan and Queen of the Valley have changed places. The early-maturing varieties seldom prove so satisfactory in the colder portions of New England, while they often occupy first place at Tenterfield.

Manhattan variety has this season given the highest average, and the highest individual yield throughout the plots. It is really a mid-season variety, and of fine quality, containing a very small percentage of small seed and rubbish, as shown in one of the trials at Tenterfield (Table C).

Coronation, on averages, was second both this year and last, and yielded highest in the variety trial at Guyra. It appears to be remarkably well suited to the conditions prevailing at Guyra, for it not only yields well, but contains a much larger percentage of marketable potatoes than elsewhere. It is late in maturing.

Queen of the Valley is a consistently good yielder in New England, and generally speaking is one of the best.

Surprise is also a splendid variety for New England district, yielding on the average a larger proportion of marketable tubers to rubbish and seed than any other variety. It is late in maturing, and of splendid cooking quality.

Carman, Manistee, and *Up-to-date* varieties are all early-maturing, light-skinned varieties, more suitable for the hotter and drier portions of the district than elsewhere. Up-to-Date did remarkably well on the Denman plots, but, as is usually the case, it did badly in New England.

Satisfaction has not come up to expectations lately; and of the new varieties under observation *Sussex* appears the most encouraging as regards yield, though not as to shape, the tubers being long with many deep eyes.

TABLE A.—Showing Results of Variety Trials with Potatoes, Northern Districts, 1916–17.

Variety.	Tenterfield.*	Red Range.*	Guyra.*	Black Mountain.*	Uralla.*	Denman.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Manhattan	9 1 2 0	3 8 2 20	3 9 0 0	1 5 2 24	4 12 0 0	7 0 1 11
Coronation	7 19 0 0	2 19 1 2	6 4 3 8	0 18 0 0	2 8 0 0	....
Surprise..	6 18 0 0	3 4 3 10	4 0 3 16	1 1 0 0	2 9 0 16	....
Queen of the Valley ..	6 6 0 0	3 8 2 8	3 16 2 10	0 16 3 8	2 11 0 0	....
Carman	5 14 0 0	2 9 2 24	3 4 3 2	0 12 0 0	0 18 2 24	6 8 2 6
Early Manistee ..	6 7 2 0	1 12 0 4	2 7 2 10	0 17 0 16	1 2 1 22	....
Up-to-Date	5 8 0 0	1 9 1 22	2 6 0 8	0 10 2 24	0 8 0 0	7 10 0 0
Satisfaction	6 4 2 0	2 10 3 12	3 3 2 1	....	1 12 2 24	3 12 2 20
Sussex	....	....	3 19 2 12	....	2 4 1 20	....
Dalhousie	....	....	2 17 1 8	....	....	....
Dalmeny Hero.. ..	....	....	2 7 2 2	....	....	....
S.I.	....	....	2 15 0 20	....	....	....

* In these cases the plots were treated with P4 mixture at the rate of 3 cwt. per acre.

The Fertiliser Trials.

With so much rain and cold weather in New England, the results obtained from the use of artificial fertilisers have not been as marked as in previous years. A large increase resulted at Tenterfield, but not so in the other plots. The P4 mixture has this year given the best average, with superphosphate second, while the figures were reversed last year, with a very small difference. The no-manure plot is again lowest at three centres, but it was considerably superior to all fertilised plots at Red Range. Last year it yielded very much less than any of the fertilised plots at Red Range. The only centre at which artificial fertiliser appears to be of very little or no value is at Guyra, where the results have been the same each year.

TABLE B.—Showing Results of Manurial Trials, Northern Districts, 1916–17.

Variety—Queen of the Valley.

Manure per acre.	Tenterfield.				Red Range.				Guyra				Black Mountain.				Uralla.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
3 cwt. P4	6	6	0	0	3	8	2	8	3	16	2	10	0	16	3	8	2	11	0	0
2 cwt. Superphosphate ..	6	7	2	0	2	16	2	8	3	12	0	12	1	1	0	0	1	11	0	8
2½ cwt. P5	6	4	2	0	3	0	1	8	3	12	3	0	0	18	1	20	1	3	0	16
No manure	4	13	0	0	3	17	2	20	3	14	0	16	0	10	2	24	1	15	0	16
3 cwt. P6	......				......				......				0	16	3	20	......			

P4 Mixture :—4 cwt. Sulphate of Ammonia.
13 cwt. Superphosphate.
3 cwt. Sulphate of Potash.

P5 Mixture:—16 cwt. Superphosphate.
4 cwt. Sulphate of Potash.

P6 Mixture:—12 cwt. Bone-dust.
4 cwt. Superphosphate.
4 cwt. Sulphate of Potash.

TABLE C.—Showing the proportion of Marketable and Seed Potatoes to Waste at Tenterfield.

Variety.	Marketable and Seed Potatoes per plot.			Waste per plot.			Percentage of Good Tubers.
	c.	q	lb.	c.	q.	lb.	
Queen of the Valley ...	10	2	0	5	1	0	66·6
Coronation	13	1	0	3	2	0	79·1
Surprise	11	2	0	2	3	0	80·7
Manhattan	15	0	14	1	1	0	92·4
Satisfaction...	10	1	14	1	1	0	89·2
Up-to-Date	9	0	0	4	1	0	68·0
Carman	9	2	0	1	3	0	84·4
Early Manistee	10	2	14	2	2	0	80·9

Conclusions.

The conclusions arrived at in previous seasons have been substantiated in almost very respect this year. The same varieties, the early and thorough preparation of the land, the maintenance of good tilth and weed prevention have all again demonstrated themselves to be essential to the best returns. The value of artificial fertilisers is more evident in the Tenterfield district than in the other portions of the north. The success with potatoes at Denman was naturally attributable to the wet season and mild summer, but satisfactory results should be possible in average years, with the aid of irrigation and the use of the earliest maturing varieties sown very early in the season.

SOUTHERN DISTRICTS.

H. C. STENING, Inspector of Agriculture.

DURING the season 1916-17 potato experiments were conducted at four centres in the southern district. The following are the names and addresses of the farmers who co-operated with the Department in carrying out the experiments:—

Mr. J. G. Downie, Wolseley Park.
Messrs. H. and R. Heinecke, Tumbarumba.
Mr. A. E. Herring, "Glen Rock," Batlow.
Mr. H. G. Hoodless, Jingellic.

The experiments comprised a variety trial and fertiliser test at each locality, and in addition a spacing test was conducted at Batlow.

As Jingellic is an early district, only early and mid-season varieties were planted, but at the other three localities late-maturing varieties were included. It was the intention to make the planting at Jingellic early in September, but the land was too saturated by heavy rains to permit of the operation, and it was therefore necessary to postpone the planting until after the middle of October. There was a continuance of wet conditions after planting, which precluded cultivation and prejudicially affected the yields at this centre. At the other three localities the plots were planted at the end of November or early in December. The fallows were well supplied with moisture, and the rainfall during the growing period was most satisfactory; at Batlow and Tumbarumba it was particularly well distributed, as a reference to Table A will show. The germination was perfect, which may be attributed to favourable planting conditions and also to the fact that the seed had been spread out in shallow layers and allowed to sprout prior to planting.

A severe early frost occurred on 24th March, which cut the crops at Tumbarumba, Wolseley Park, and Batlow while they were quite green.

TABLE A.—Showing Rainfall during growing period, Southern Districts, 1916-17.

Month.	Tumbarumba.	Batlow.	Wolseley Park.
1916.	points.	points.	points.
November	....	3	....
December	439	297	260
1917.			
January	398	499	287
February	227	307	157
March (to 12th)	50	31	75
Total... ...	1,114	1,137	779

The rainfall records at Jingellic are not available.

Soil and Cultural Notes.

Tumbarumba.—The soil was a chocolate loam of basaltic origin, which had been cropped three times previously with potatoes. It was ploughed 7 inches deep and harrowed at the end of September, 1916; again ploughed and seed planted 4 inches deep on 1st and 2nd December, the sets being placed 15 inches apart in rows 30 inches apart. The crop was inter-cultivated, and was eventually cut back with frost on 24th March.

Batlow.—The plots here were on chocolate basaltic loam, which had been cropped once previously with oats and peas (mixed) that had been fed-off with pigs. The land was ploughed 7 inches deep in August, 1916, harrowed, cross-harrowed, and disced; on 27th and 28th November it was again ploughed and the seed planted 5 inches deep, the sets being placed 15 inches apart in rows 36 inches apart; the plots were harrowed after planting and inter-cultivated. The crops on the lower portions of the slope were frosted on 24th March.

Potato Experiment Plots at Batlow.

Early Manistee—Yield, 9 tons 2½ cwt. per acre. Up-to-Date—Yield, 10 tons 10 cwt. per acre.

Jingellic.—This was an alluvial loam, apparently of granite and slate origin, situated on a creek flat. The land had been cropped for a few years, the previous crop being potatoes. It was ploughed 8 inches deep in the middle of July, cross-ploughed 5 inches deep in the middle of September, then harrowed and cross-harrowed; ploughed and the seed planted 5 inches deep on 18th and 19th October, the sets being placed 18 inches apart in rows 36 inches apart.

Wolseley Park.—The soil was a loam of slate derivation, which had not been cultivated for nearly twenty years. It was ploughed 7 inches deep in

August, harrowed in September and ploughed and the seed planted 5 inches deep on 5th December, the sets being placed 15 inches apart in rows 34 inches apart. The crops were cultivated in January, and a severe frost caught them on 24th March. Cockatoos also caused damage.

TABLE B.—Showing Results of Variety Trials, Southern Districts, 1916–17.

Manured with P4 Mixture at 3 cwt per acre.

Variety.	Tumbarumba.			Batlow.			Jingellic.			Wolseley Park.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
Carman No. 1	10	1	0	11	10	0	3	16	1	4	10	0
Coronation	11	2	2	11	3	1		....		3	14	2
Early Manistee	10	13	3	9	2	2	3	5	0	4	15	3
Up-to-date	8	14	0	10	10	0	2	15	0	2	17	1
Premier	9	16	2	9	8	0		....		2	10	0
Manhattan	9	16	3	7	9	1	4	4	2	3	13	3
Surprise	8	9	2	9	4	0		....		2	4	3
Queen of the Valley	11	15	1		....			....			....	
Early Vermont		....			....		5	18	3		....	
Early Rose		....			....		3	12	1		....	
Satisfaction...		....			....		3	3	2		....	

The heavy yields at Tumbarumba and Batlow can to a large extent be attributed to seed-selection, the seed planted at these two centres having been carefully selected from the most prolific roots of the varieties grown on the previous year's experiment plots. In general practice no attempt is made in the selection of the seed, and it is not a matter of surprise that varieties quickly degenerate in type and yielding capacity. Wheat-growers and maize-growers are awakening to the importance of seed-selection, and it is to be hoped that potato-growers in general will not be long in realising what can be done by adopting more improved methods in the choice of seed.

Details of Varieties.

Only one trial was made of *Queen of the Valley,* viz., at Tumbarumba, where it returned the highest yield.

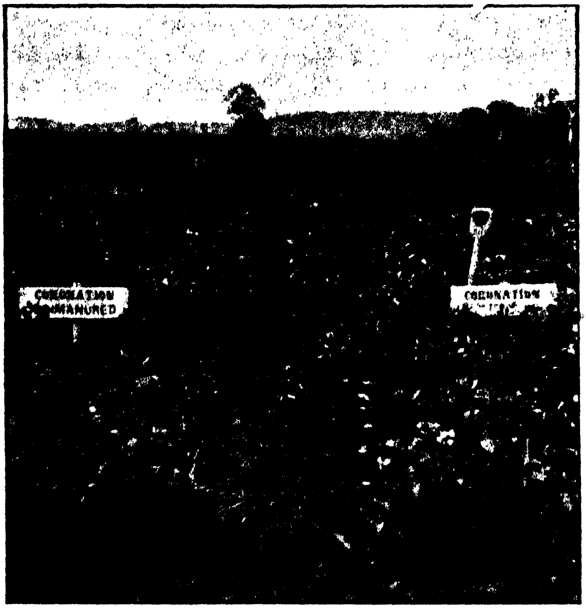
Carman No. 1, besides being top yielder at Ballow, has, for the second year in succession, attained the highest average yield.

Coronation.—According to the experiments, extending over a number of years, this variety has been the most consistent yielder for the potato districts in the southern portion of the State.

Early Manistee gave the highest yield at Wolseley Park. It matured earlier than all the other varieties tested. The high positions in the average yields of Carman No. 1, Coronation, and Early Manistee support the results obtained in the previous year's experiments, when on averages Carman No. 1 came first, Early Manistee second, and Coronation third. In addition to yielding capacity, these three varieties can be recommended for their excellent cooking qualities.

As in the previous season's tests, *Premier, Manhattan,* and *Surprise* occupy relatively low positions in the average yields. In addition, Premier produces a large proportion of small tubers; only 81 per cent. of the tubers produced were of marketable size, as compared with about 93 per cent. produced by the other varieties tested.

Early Vermont gave easily the highest yield at Jingellic. It is grown with good results throughout the southern districts, and deserves further trial.



Potato Experiment Plcts at Batlow.
On left :—Coronation, unmanured. Yield, 7 tons 18 cwt. per acre.
On right :—Coronation, manured with 2 cwt. superphosphate per acre. Yield, 10 tons 17 cwt. per acre.

Manurial Experiments.

Fertiliser tests were carried out in each locality, Coronation being the variety used at Batlow, Tumbarumba, and Wolseley Park, and Carman No. 1 at Jingellic. In every instance the fertilisers were spread by hand along the drills.

TABLE C.—Showing Results of Manurial Experiments, Southern Districts, 1916–17.

Manure per acre.	Tumbarumba.*			Batlow.*			Jingellic.†			Wolseley Park.*		
	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
No manure	10	16	0	7	18	0	3	10	0	2	11	3
‡ 3 cwt. P6 mixture	10	15	1	9	6	1	4	5	3	2	16	1
‡ 2½ cwt. P5 mixture	10	19	2	9	15	0	4	6	3	3	13	0
‡ 3 cwt. P4 mixture	11	2	2	11	3	1	3	16	1	3	14	2
2 cwt. Superphosphate	10	3	0	10	17	0	4	14	3	3	17	3

* Variety used, Coronation. † Variety used, Carman No. 1.
‡ The composition of these mixtures is given on page 777.

Substantial increases have resulted in every instance, except at Tumbarumba, where the rich basaltic soil has failed to respond appreciably to applications of fertiliser.

The increases are set out more clearly in Table D, where it will be seen that the soil at Batlow responded to manuring in quite a remarkable manner, 3 cwt. of P4 mixture per acre returning an increase of 3 tons 5 cwt. 1 qr. per acre over the yield of the unmanured plot. This mixture also gave the best results at Tumbarumba, while 2 cwt. of superphosphate per acre gave the largest increases at Jingellic and Wolseley Park. The values of the increases on a cash basis are shown in Table E, the price of potatoes being taken at £8 per ton. The highest average gross monetary increase resulted from the P4 application, but this is a comparatively expensive fertiliser, and when prices are taken into account the highest average net profit is obtained by an application of 2 cwt. of superphosphate, as reference to Table F will show.

The prices of the fertilising applications are as follows:—

	£	s.	d.
3 cwt. P4 mixture	1	12	3
2½ cwt. P5 mixture	0	18	6
3 cwt. P6 mixture	1	8	8
2 cwt. Superphosphate	0	9	9

TABLE D.—Showing Increase per acre due to Manure, Southern Districts, 1916-17.

Manure per acre.	Tumbarumba.			Batlow.			Jingellic.			Wolseley Park.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
3 cwt. P6 mixture	(−) 0	0	3	1	8	1	0	15	3	0	4	2
2½ cwt. P5 mixture	0	3	2	1	17	0	0	16	3	1	1	1
3 cwt. P4 mixture	0	6	2	3	5	1	0	6	1	1	2	3
2 cwt. Superphosphate	(−) 0	13	0	2	19	0	1	4	3	1	6	0

(−) Signifies Decrease.

TABLE E.—Showing Value of Increase per acre, Southern Districts, 1916-17. Crop valued at £8 per ton.

Manure per acre.	Tumbarumba.			Batlow.			Jingellic.			Wolseley Park.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
3 cwt. P6 mixture	(−) 0	6	0	11	6	0	6	6	0	1	16	0
2½ cwt. P5 mixture	1	8	0	14	16	0	6	14	0	8	10	0
3 cwt. P4 mixture	2	12	0	26	2	0	2	10	0	9	2	0
2 cwt. Superphosphate	(−) 5	4	0	23	12	0	9	18	0	10	8	0

(−) Signifies Loss.

TABLE F.—Showing Profit due to Manuring, Southern District, 1916–17.

Manure per acre.	Tumbarumba.	Batlow.	Jingellic.	Wolseley Park
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
3 cwt. P6 mixture	(–) 1 14 8	9 17 4	4 17 4	0 7 4
2½ cwt. P5 mixture	0 9 6	13 17 6	5 15 6	7 11 6
3 cwt. P4 mixture	0 19 9	24 9 9	0 17 9	7 9 9
2 cwt. Superphosphate	(–) 5 13 9	23 2 3	9 8 3	9 18 3

(–) Signifies Loss.

Ordinary superphosphate, which is within the reach of everyone at £4 17s. 6d. per ton, has proved to be the most profitable fertiliser, an application of 2 cwt. per acre being responsible for an average net profit over all the plots of £9 4s. 3d. per acre; at Batlow the net profit as the result of its use was £23 2s. 3d. per acre. Surely that is sufficient to induce growers to use it.

Spacing Test.

At Batlow a test was conducted to determine the best distance apart for the planting of sets. Coronation sets, averaging about 2 oz. in weight, were planted in this test, and at 12 inches, 15 inches, 18 inches, and 24 inches apart in the rows. The results are greatly in favour of the closer spacings, as shown in the table.

TABLE G.—Showing Results of Spacing Test at Batlow.

Sets 12 inches apart and rows 3 feet apart yielded 12 tons 4 cwt. 3 qrs. per acre.
Sets 15 inches apart and rows 3 feet apart yielded 11 tons 3 cwt. 1 qr. ,,
Sets 18 inches apart and rows 3 feet apart yielded 10 tons 7 cwt. 0 qrs. ,,
Sets 24 inches apart and rows 3 feet apart yielded 9 tons 11 cwt. 2 qrs. ,,

Most growers err in being too sparing with seed, using on an average about 7 or 8 cwt. per acre. When sets averaging 2 oz. in weight are planted 24 inches apart in rows 3 feet apart, it takes 8 cwt. of seed to plant an acre. Now it is shown in this test that when sets are placed 12 inches apart, thus doubling the amount of seed required to plant an acre, the additional 8 cwt. of seed has increased the yield by 2 tons 13 cwt. 1 qr. per acre. When sets are placed as far apart as 24 inches, the tendency is for the production of tubers that are too large and coarse; closer spacings produce heavier yields of potatoes of better quality. Best results will be obtained on average potato soils when the sets are spaced 12 inches to 15 inches apart. The distance, however, recommended as the best between the rows is 30 inches, the sets to be 15 to 18 inches apart in the rows. This will require 13 cwt. seed per acre at the former spacing and 15½ cwt. at the latter spacing, assuming of course that the average weight of sets is 2 oz., which is a fair size. It is a mistake to cut sets too small, as small sets are responsible for "misses" and degeneration. In the early stages of growth the shoots are entirely dependent on the set for nourishment, and it is therefore obvious that small-sized sets cannot give the crop such a satisfactory start as larger sets.

SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

The following farmers co-operated with the Department in carrying out the potato experiments on the South Coast and Southern Tablelands during the 1916-17 season:—

Mr. J. H. Martin, Pambula.
Mr. J. Chittick, Kangaroo Valley.
Mr. O. E. Silk, "Woodbine," Nimmitabel.
Messrs. Cunningham Bros., McAlister.
The Superintendent, Boys' Farm Homes, Mittagong.

The season was altogether too wet on the coast for the crop. At Kangaroo Valley a total loss was caused by the continuous rains, and the Pambula plot was considerably reduced in yield on the same account. On the Southern Tablelands heavy rain was experienced during the last quarter of 1916, and a number of the sets rotted in the ground just after planting, this being particularly noticeable at Mittagong, where 3,162 points of rain were registered during the growing season. The loss was due chiefly to wet-rot. As far as could be ascertained, there was no evidence of Irish blight until late in the season.

The Varieties under Trial.

Of the varieties under test, the best-known was *Manhattan*; it yielded well, but, as usual with this variety, a number of the largest sized tubers were lost through wet-rot. It is favorably known on the highlands for culinary purposes, but on the coast one often meets those who condemn it on account of "soapiness."

Carman No. 1 is fast coming into favour among growers, both on the coast and highlands, as a good market variety and of good cooking qualities. It is white-skinned and a very fair cropper.

Early Manistee is not up to the aforementioned perhaps in point of yield, but it is decidedly the best quality table potato yet tried on the plots. At present it is in big demand, and likely to be largely grown in the future when seed is more plentiful. *Up-to-Date,* once popular, is not now meeting with so much approval; second growth is troublesome with this variety.

Satisfaction did not yield well, and large-sized potatoes often showed hollows in the middle. Evidence of fleck was also present.

At Nimmitabel and McAlister, *Queen of the Valley* grew well, producing satisfactory results in the manurial tests. This variety is popular in the cold districts, and brings good prices on the Sydney market. The characteristic deep eyes are productive of a certain amount of waste when peeling.

Coronation is coming more into favour in some localities. It has great vitality; indeed, it is seldom one notes a "miss" in the sets.

Surprise yielded well at Nimmitabel. Large potatoes of poor keeping quality sums up this variety.

Langworthy did not stand the wet weather well; germination was bad, hence the low yield. It is a white-skinned potato of fine cooking quality.

TABLE A.—Showing Results of Variety Trial, South Coast, 1916–17.

Variety.	Mittagong.				Pambula.				Nimmitabel.				McAlister.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Manhattan	0	16	3	20	4	17	1	20	4	16	1	20	1	11	0	8
Up-to-Date	0	11	3	4	2	14	0	0	3	15	0	0	2	11	1	20
Carman No. 1	0	11	1	12	4	11	3	12	5	7	0	16	2	11	2	24
Satisfaction	0	6	0	0	2	12	2	24	4	11	0	8	2	1	1	20
Early Manistee		....			1	17	1	4	4	8	1	20		....		
Early Rose	1	3	0	16		....				....				....		
Queen of the Valley ...		....				....			7	0	0	0	3	16	1	4
Coronation		....				....			5	12	2	0		....		
Surprise		....				....			5	1	3	4		....		
Langworthy		....				....			2	18	3	20		....		

Manurial Tests.

Owing to the market being bare of potash the manurial tests were, in some cases, short of certain mixtures.

The increases due to manures were most satisfactory. P6 mixture gave an increase at Nimmitabel of 2 tons 3 cwt. 2 qrs. 12 lb. over the untreated plot, and at McAlister the increase due to the same mixture was 2¼ tons. The results from 2 cwt. of superphosphate per acre at Nimmitabel were almost as good as from double that quantity on an adjoining block. This has been observed before. The mixtures P4 and P5, both now well known, gave satisfactory returns above the unmanured section. Until the war is over there is little chance of securing potash, an ingredient of both these mixtures.

TABLE B.—Showing Results of Manurial Trial, South Coast, 1916–17.

Manure.	Mittagong.				Pambula.				Nimmitabel.				McAlister.			
Per acre.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
2 cwt. Superphosphate	1	1	3	2	3	14	2	24	7	0	0	0	3	15	0	0
4 ,, ,, ..		....				....			7	1	3	20		....		
2½ ,, P5	0	16	3	20	4	17	1	20	7	10	0	0	3	2	0	16
3 ,, P6		....				....			9	12	3	16	5	2	0	0
3 ,, P4	1	9	3	4	4	8	2	16	8	11	1	20		....		
*3 ,, W2		....				....				....			4	2	1	4
No manure	0	6	1	20	1	15	0	24	6	19	1	4	2	17	3	12

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* The mixture W2 consists of six parts superphosphate, three parts sulphate of ammonia, and one and a-half parts sulphate of potash. The compositions of the other mixtures are given on page 777.

Whole *versus* Cut Seed.

At Mittagong an interesting experiment was conducted, in which whole seed was sown as against cut seed. An average sample of seed was sorted, and the larger tubers cut once, the size of the whole seed being about that of a small hen's egg. The whole seed was spaced a little further apart, so that about the same weight of seed was sown on each plot. The season favoured the whole seed, but the yields in both cases were very low. As far as coastal conditions are concerned, whole seed must be recommended every time.

Test of Whole *versus* Cut Seed Potatoes at Mittagong.

		t.	c.	q.	lb.
Cut Seed (Up-to-Date)	...	0	11	3	4
Whole Seed ,,	...	0	17	3	14

I would again impress upon potato-growers the absolute necessity of providing good drainage in ground used for potatoes. The loss every season that is practically attributable to bad drainage is very great.

BIRDS' STOMACHS REQUIRED.

UNDER the auspices of the Executive Committee of the Advisory Council of Science and Industry, an investigation is being carried out into the feeding habits of Australian birds, supplementary to work already done in this State. Mr. A. M. Lea, of the South Australian Museum, has kindly undertaken for the present to examine the contents of birds' stomachs submitted to him for this purpose. These can be sent to the Adelaide Museum in spirits, or in tins with rags saturated in spirits (so as to arrive in Adelaide in a damp condition). When sending the stomachs the following particulars are desired:—Name of bird (technical, if possible), month when obtained, locality, and collector's name. If the birds have been poisoned, it is also desirable to mention that fact. In particular, he would be glad to receive stomachs of large birds, but especially desires to state that he does not wish any birds to be specially killed for the purpose of this investigation. Due credit will be given to all those who send stomachs when the results are published, and will be acknowledged as received.

Should any correspondents who are willing to help in this work find it inconvenient to send the specimens to Adelaide, they can be forwarded to Dr. J. B. Cleland, Department of Public Health, Macquarie-street, Sydney, who will send the material on later.

In some cases, when circumstances permit, it may be possible to send the fresh bird to Sydney, where it can be accurately identified and the stomach removed. From time to time emus, plain turkeys (bustards), native companions, and other large birds may be found dead. If possible the stomach should be taken out and forwarded for the purpose of examination.. No useful birds should be slaughtered for the purposes of this investigation alone.

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1916–17.

SOUTHERN DISTRICTS.

H. C. STENING, Inspector of Agriculture.

MAIZE experiments were conducted at two centres in southern districts during the season 1916-1917, viz., at Tumut and Jingellic. The experimenters were—

Mr. H. G. Hoodless, Jingellic.
Dr. W. H. Mason, Tumut.

The Tumut Plots.

Owing to the flooded condition of the river flats at Tumut it was necessary to select a site on high land, which is not locally considered very suitable for cropping with maize. The soil was an alluvial clay loam that had been in cultivation for over twenty-five years, the previous crop being wheat. On account of the saturation of the soil it was necessary to postpone sowing until 2nd and 3rd November. Heavy rains continued to fall after sowing, with the result that portions of the land became waterlogged, causing the crop to be stunted. The extent of the stunted crop varied considerably on the different plots, so that a fair comparison of the yields was impossible, and it has been decided to withhold the yields from publication. As yields of up to 60 bushels per acre were obtained, it may be considered that it was proved that this class of land will produce satisfactory yields of maize in a favourable season.

As far as could be judged from the grain that was harvested at Tumut, it would appear that Leaming, Funk's Yellow Dent, and Gold Standard Leaming, in the order named, were easily the best yielders, which supports the results obtained at Jingellic.

The Jingellic Plots.

The soil was a clay loam of slate derivation, which had been cultivated for very many years, the previous crop being maize. The land was ploughed 8 inches deep the second week in August, cross-ploughed 5 inches deep and harrowed the second week in September, harrowed again the first week in October, and once more before sowing. Owing to wet conditions sowing was delayed until 20th and 21st October, the seed being sown in rows 3 feet 4 inches apart with a one-row maize dropper, dropping single grains every 16 inches. The germination was satisfactory, but continued wet weather keeping the soil in a saturated condition prevented the necessary cultivation of the crops, and weed growth was not checked. Sorrel made prolific growth and seriously affected the yields. The superabundance of moisture caused the maize to be stunted, and militated against the production of satisfactory yields. The results are briefly set out in the table:—

Variety.	Yield per acre.	
	bus.	lb.
Leaming	34	32
Funk's Yellow Dent	25	14
Gold Standard Leaming	22	44
Hickory King	18	20
Early Yellow Dent	16	40
Reid's Yellow Dent	14	40
Boone County	12	32
Iowa Silvermine	11	18

All the varieties were manured with superphosphate at the rate of 2 cwt. per acre.

Manurial Experiment.—A fertiliser test, consisting of six plots, was sown with Funk's Yellow Dent, the fertiliser being applied through the fertiliser attachment to the maize-dropper. One plot was unmanured, and the remaining plots received application of fertilisers as shown in the table. For the purposes of the commercial comparisons, maize is valued at 3s. per bushel:—

Manure per acre.	Yield per acre.		Increase per acre due to Manure.		Value of Increase per acre.			Cost of Manure per acre.			Profit due to Manuring		
	bus.	lb.	bus.	lb.	£	s.	d.	£	s.	d.	£	s.	d.
No manure	7	34	......		......			. ...			......		
*1¼ cwt. P5	9	0	1	22	0	4	2	0	9	3	(—) 0	5	1
*2 cwt. P7	13	22	5	44	0	17	4	0	15	0	0	2	4
1 cwt. Superphosphate, and 1¼ cwt. P5 at tasselling ...	17	54	10	20	1	11	0	0	14	1	0	16	11
1 cwt. Superphosphate ...	18	20	10	42	1	12	3	0	4	10	1	7	5
2 cwt. Superphosphate ...	25	14	17	36	2	12	11	0	9	9	2	3	2

( ) Signifies Loss.

* The fertiliser mixture P5 consists of 16 cwt. superphosphate and 4 cwt. sulphate of potash; P7, 10 cwt. superphosphate and 10 cwt. bone-dust.

The application of fertilisers resulted in profitable increases in every instance, with the exception of the case in which P5 alone was used, the increase there being insufficient to cover the additional expense. A notable increase was returned as the result of an application of 2 cwt. of superphosphate per acre, viz., 17 bushels 36 lb. per acre, which represented a profit approximating £2 3s. 2d. per acre.

Seeding Test.—This test comprised two plots, sown throughout with Funk's Yellow Dent. In one, single grains were dropped every 16 inches, while in the other, two grains were dropped every 32 inches. The results were as follows:—

	bus.	lb.
Single grains, 16 inches apart	25	14
Two grains, 32 inches apart	23	46

SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

The following farmers co-operated with the Department in the maize experiments conducted on the South Coast and southern highlands during the past season:—

Mr. J. Timbs, "Tara," Albion Park.
Mr. T. A. Bateman, "Ireton Wood," Albion Park.
Mr. J. Chittick, Kangaroo Valley.
The Superintendent, Boys' Farm Homes, Mittagong.
Mr. D. Shepherd, "Narrawallie," Milton.
Mr. J. J. Heffernan, "Yarragie," Moruya.
Mr. J. H. Martin, Pambula.
Mr. C. Ingold, "Yatte Yatta," Milton.
Mr. G. Lindsay, Dapto.
Mr. J. Guthrie, Mogilla, *via* Bemboka.

The season proved one of the rainiest experienced for many years. In most instances the planting was made on wet soil, and the weather continued very wet during the spring and early summer. Constant rain during November and December made the cultivation of the crops exceedingly difficult, so much so that in several cases the work had to be abandoned, and the crops became very dirty with weed growth. These conditions were most pronounced at Kangaroo Valley and at Mr. Bateman's farm at Albion Park, the ground in each case being altogether too wet to work. In other cases it was only by continuous work that the weeds were kept under control, but the efforts of the farmers were rewarded with yields higher than has yet been attained on experiment plots on the South Coast.

A new feature, and one which aroused considerable interest among the farmers, was the system adopted at Moruya, by which the farmers of the district were invited, through the local branch of the Agricultural Bureau, to bring seed of varieties of maize of their own selection and growing, and to personally sow them on the same plot and under the same conditions as the seed supplied by the Department. Mr. J. J. Heffernan offered a paddock close to the town for the work, and prepared the ground in the usual way. On 2nd November, 1916, a meeting of the branch of the Bureau was called, at which a number of farmers and others interested attended, to sow and to assist in sowing the seed. The secretary of the branch, Mr. Flynn, took a very keen interest in the work throughout.

The grain was sown in rows 4 feet apart, groups of three grains being dropped by hand about 30 inches apart in the rows. Germination was satisfactory. The plants grew well, but the wet weather conditions were responsible for an attack of leaf blight, which affected some of the varieties more or less. The yields from the varieties sown by the farmers (who met and harvested their own plots when mature) follow. Those obtained from the varieties sown by the Department may be seen in Table B, where they are compared with the same varieties grown in other districts.

TABLE A.—Showing Results of Maize Trials, Farmers' Seed, South Coast, 1916–17.

Farmer's Name.	Variety.	Yield per acre.	
		bus.	lb.
F. J. Staunton ...	Giant White	46	17
P. Flynn	Red Indian	63	42
A. Louttit	Moruya Yellow	86	0
P. Flynn	Golden King	71	32
A. Louttit	Goldmine	66	16
H. P. Jeffery... ...	Improved Yellow Dent ...	28	32
W. Ryan	Yellow Moruya	50	0
P. Flynn	Hickory King	65	30
C. Helman	Yellow Moruya	46	17
C. Helman	Giant White	50	0

On this plot, as in other experiments with maize for grain during the season under review, the long season varieties fared better than the shorter, probably on account of meeting drier weather conditions at the tasselling period. As so much interest was created in this system of maize experiment, it is to be extended to other districts on the South Coast in the coming season. It is hoped that farmers will evince a similar keen interest to that at Moruya.

The returns from the different districts, as shown in Table B, are very satisfactory, those from the Milton plot being the best yet obtained for most of the varieties. It will be noted that Funk's Yellow Dent and Red Hogan varieties attained very satisfactory yields on most of the plots. There is every reason to believe that the former variety will occupy a large area of maize-growing land on the South Coast in the future. It is a variety showing plenty of character, with a fair length of cob, well filled on the tips and butts, ranking as a mid-season variety in point of maturity. Of all the varieties tried, Red Hogan was much the latest in maturing. It is very popular among farmers, no doubt on account of its being a good yielder on the stronger soils.

The highest yield of all was obtained at Milton from Silvermine. On all plots this variety was by far the earliest in maturing. It has much to commend it, and for many years was a very popular variety in the Bega district. The cobs are of medium size and the grain white; the stalks do not grow high as a rule, and are fine. There is no doubt, when seed of this variety becomes plentiful, it will be largely grown; already there is a demand for it from those who have grown it in the past.

Goldmine is a yellow variety, having something the same habit of growth; the grain possesses a peculiar sharp-pointed tip. The seed of this variety was secured from a farmer at Moruya.

Leaming is a variety suitable to coastal conditions. The cobs, as a rule, are short compared with other varieties; still, they carry plenty of grain.

Gold Standard Leaming did not, on the whole, yield so well. It is hoped that the work that is being done by the Department on the ear-to-row method will result in the improvement of this variety.

Boone County White, a mid-season variety, kept up its reputation as a high-yielding variety under wet conditions; the grain possesses a lot of character. This variety was attacked by numbers of parrots at Kangaroo Valley, the husk being torn away to get at the grain, and consequently the yield was much reduced. Mr. Chittick is a great admirer of the variety.

Giant White, a variety largely grown at Moruya—whence the seed was obtained—did not yield so well as other white varieties, although it is a very attractive corn; the cobs are large, and carry grain of large size.

Mastodon, a yellow variety, producing large cobs, matures late; the grain has a rough tip. It was perhaps the most disappointing of all the varieties.

Reid's Yellow Dent did not yield as well as was expected. It has not been long with us, and may yet prove of some use on some soils; the cobs are often very attractive.

Improved Yellow Dent, now so well known on the South Coast, yielded well, keeping up its reputation as a mid-season variety.

TABLE B.—Showing Results of Maize Variety Trials for Grain, South Coast, 1916-17.

	D. Shepherd, Milton.		J. H. Martin, Pambula.		J. Timbs, Albion Park.		J. J. Heffernan, Moruya.		J. Chittick, Kangaroo Valley.	
	bus.	lb.	bus.	lb	bus.	lb.	bus.	lb.	bus.	lb.
Funk's Yellow Dent ...	75	22	81	0	93	24	80	40	81	24
Reid's Yellow Dent ...	77	44	67	28	78	16	51	24	57	8
Improved Yellow Dent ...	107	45	72	0	92	48	42	8	88	32
Improved Yellow Dent (no manure)	81	49	55	40	75	8	....		72	28
Leaming	110	11	72	0	75	40	52	48	83	8
Gold Standard Leaming..	107	45	72	28	59	8	42	8	76	0
Red Hogan	95	29	97	12	97	38	69	8	90	16
Mastodon	77	44	78	24	76	0	35	40	45	8
Goldmine	106	25	88	28	95	38	50	0	64	16
Boone County White ...	108	49	75	0	67	24	38	4	44	52
Giant White	74	21	93	0	70	0	47	8	68	20
Silvermine	110	10	84	0	87	34	34	14	47	24

Except where otherwise stated, the above plots were manured with 2 cwt. per acre of the mixture P7.

Manurial Trials.

The plots were treated throughout with the mixture P7, at the rate of 2 cwt. and an approximate cost of 12s. per acre The exceptions to this were the plots of Improved Yellow Dent which were left unmanured at four centres to enable comparisons to be made. Appreciable increases were obtained in each case, the largest being that at Milton, where the fertiliser was responsible for an increase of 25 bushels of grain per acre. The soil at Milton was a good class alluvial, and the wisdom of the application was questioned by the owner; indeed, it was a great surprise to him to note the effect of the manure on ground thought to be strong enough to produce heavy crops without manure.

A manurial test was conducted at Albion Park, but owing to the wet weather cultivation was impracticable, and weed growth competed with the crops, with the result that the effects of the manures are not fully seen in the yields.

MANURIAL Trial for Grain.

Variety—Improved Yellow Dent. Experimenter—
T. A. Bateman, Albion Park.

Manure.	Yield per acre.	
	bus.	lb.
Superphosphate, 1 cwt. per acre	41	14
,, 2 cwt. ,, ...	47	8
*P7, 2 cwt. per acre	44	0
Superphosphate 1 cwt., bone-dust 1 cwt., and sulphate of potash ½ cwt. per acre	31	2
No manure	29	4

* The mixture P7 consists of equal proportions of superphosphate and bone-dust.

Maize for Green Fodder.

Four plots for green fodder or ensilage were sown. At Bemboka the plot was practically destroyed by heavy weather, the rank growth being beaten down by wind and rain. At Dapto, in consequence of a misunderstanding, an excellent crop was siloed before the returns had been noted. The remaining plots at Mittagong and Milton produced satisfactory returns considering the conditions they had to meet. The Mittagong plots were specially good, the soil being very poor, as may be noted from the returns from the unmanured section. The stuff from these plots was siloed with excellent results.

In this series of experiments there was not much to choose between the mixture applied. If there was any preference it might be given to the superphosphate, bone-dust, and sulphate of ammonia mixture. Altogether the experiments were satisfactory, the yields certainly being gratifying.

TABLE C.—Showing Results of Manurial Trials for Fodder, South Coast, 1916-17.

Variety—Improved Yellow Dent.

Manure.	Farm Homes, Mittagong.				C. Ingold, Milton.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 1 cwt. per acre...	7	12	3	12	10	11	1	20
,, 2 cwt. ,, ...	10	17	0	16	10	0	0	0
P7, 2 cwt. per acre	12	15	2	24	10	0	0	0
Superphosphate 1 cwt., bone-dust 1 cwt., and sulphate of potash ½ cwt. per acre	13	11	1	20	13	0	0	0
Superphosphate 1 cwt., bone-dust 1 cwt., and sulphate of ammonia ½ cwt. per acre	13	0	0	0	14	11	1	20
No manure	4	12	3	12	9	11	1	20

Maize Improvement.

SEASON 1916–17.

H. WEHNOLZ, B.Sc. (Agr.), Inspector of Agriculture.

THE past season has been an extremely good one for maize in nearly all parts of the State, and some good yields were recorded from the maize improvement plots. During the season ear-row tests for the purpose of demonstrating the difference in yielding capacity of the different strains of a variety of maize, as represented by different ears, were carried out on Farmers' Plots at Sherwood, Coramba, Inverell, Moruya, and Pambula, in addition to the usual plots at the Experiment Farms.

Leaming at Grafton.

The ear-row test with Leaming at Grafton Experiment Farm was sown on 16th November, 1916, in rows 4 feet apart and 2½ chains long. Every fifth row was sown with seed from selected ears of good type, which was well mixed together. These rows serve as a check upon the uniformity of the ground used for the experiment, and should not vary greatly throughout the plot, otherwise it would be almost impossible to say whether the variation between the ear-rows was not due to the same cause, and the determination of the best yielding ears would be a difficult matter. Table I (on the following page) shows the yield of each row of the plot, with other information concerning it.

The following notes on some of the rows which appeared to be distinct in some degree were taken during growth:—

Row 7.—Growth, 10 feet. Appears vigorous and of dark-green colour.

Row 8.—Very short growth, 8 feet; leaves very broad; 50 per cent. barren stalks.

Row 20.—Very tall growth; ears high on the stalk. Not a good type of ear or grain.

Row 21.—Weak stalks, nearly half of which lodged; also about 20 per cent. barren.

Row 22.—Short stalks; ears comparatively high on the stalk; about 30 per cent. of the stalks bearing two ears.

Row 23.—Tall dark-green growth. Type of ears very good.

Row 25.—Weak stalks; about 20 per cent. lodged.

Row 26.—Dark-green growth; broad leaves.

Row 27.—Tall, dark-green colour.

Row 33.—Short stalks, many two-eared; leaves narrow.

Row 43.—About 30 per cent. of stalks with two ears.

TABLE I.—Ear-row Test—Leaming—Grafton Experiment Farm

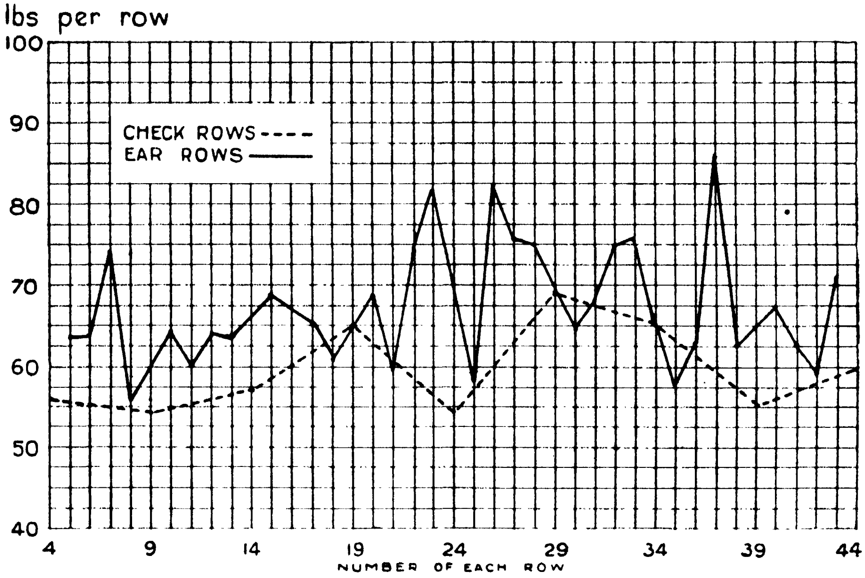
Registered Ear Number.	Number of Row.	Germination, per cent.	Suckers, per cent.	Number of Albino Seedlings.	Yield of Ear Corn per row.
					lb.
Check ...	4	62	60	0	56
119 ...	5	76	56	0	63
114 ...	6	79	17	0	63½
112 ...	7	86	32	1	74
104 ...	8	75	67	0	57
Check ...	9	72	74	1	54½
124 ...	10	83	67	0	64½
123 ...	11	88	29	0	60
120 ...	12	86	112	0	64
117 ...	13	83	93	0	63½
Check ...	14	62	81	0	57
113 ...	15	91	34	0	68
110 ...	16	79	63	0	60
108 ...	17	79	94	0	66
102 ...	18	80	60	2	60½
Check ...	19	73	91	0	65
94 ...	20	85	29	0	68½
95 ...	21	82	54	0	59½
96 ...	22	89	49	0	74½
97 ..	23	89	44	0	82
Check ..	24	72	86	0	54
98 ...	25	80	57	0	58½
99 ...	26	89	98	0	82½
100 ...	27	90	36	0	76
101 ...	28	82	66	0	75
Check ...	29	75	57	0	69
103 ..	30	67	81	0	64½
106 ...	31	80	89	0	68
109 ...	32	89	56	0	75
111 ...	33	78	99	1	75½
Check ...	34	77	96	0	65
125 ...	35	77	41	0	58
122 ...	36	87	77	0	63
118 ...	37	81	114	0	85½
116 ...	38	88	63	2	62½
Check ...	39	70	80	0	56
105 ...	40	77	105	0	67½
107 ...	41	85	23	0	62½
115 ...	42	73	47	4	59
121 ...	43	82	67	2	71
Check ...	44	67	59	0	59½

The difference in growth between the rows gives an idea of the variation that may be expected in the yields of the individual rows. It might be mentioned here that there is so wide a difference in yield between the best and poorest yielding rows that it is not necessary to shell the whole of the produce from each row to find out which are the best. In order to get the average yield per acre of shelled grain from the plot a given weight of ears is allowed to dry and then shelled, and the percentage of shelled grain per ear is applied to the total weight of ear corn. This method has been found to be very accurate, as well as having the advantage of leaving the ears intact for further selection.

The yields of the check rows varied from 54 to 69 lb. per row, and of the ear rows from 57 to 85½ lb. The average yield of the plot was 64·4 bushels of shelled grain per acre, and that of the best ten rows 75·0 bushels per acre. The best row yielded at the rate of 85·3 bushels per acre.

It will be seen from the figures that in the first place there is some variation between the germination percentage of the different ears, but that this alone is not sufficient to account for the yield is shown by the fact that in row 37 we have a percentage germination of 81, and a yield of 85½ lb., and in row 38 a germination of 88 per cent., and a yield of only 62½ lb. There is, however, on the average a correlation between high percentage **germination and high yield. This is shown by the following figures:—**

Percentage germination	Yield in bushels per acre.
85 to 90	69·5
80 to 85	65·3
75 to 80	62·9
70 to 75	59·4
65 to 70	55·3



Graph 1.—Showing yields of Ear-row Test of Leaming Maize at Grafton Experiment Farm, 1916-17.

There does not seem to be any direct relation between the percentage of suckers and yield, as is seen by the following figures:—

Per cent. suckers.	Yield in bushels per acre.
90 or over	70·9
70 to 90	58·1
50 to 70	62·9
Below 50	67·9

It is interesting to see, however, that most of the best yielding rows have a high percentage of suckers. This abundant formation of **suckers is natural to this variety.**

It is well known that, amongst other factors, the formation of suckers depends to some extent on the thickness of the stand, a thin seeding giving a higher percentage of suckers on the same land than a thick seeding. From the figures in Table I, giving the percentage of germination and the corresponding percentage of suckers of the different ear rows, it will be seen that there is a strong hereditary tendency to sucker formation, as the percentage of suckers does not show any relation to the percentage germination.

Percentage germination.	Percentage of suckers.
85 to 90	53
80 to 85	74
Below 80	67

The presence of albino seedlings* is regarded by some as an indication of loss of vigour, and although rows 18 and 42 show both albino seedlings and low yields, rows 7 and 43 with these seedlings show high yields. It does not seem, from the figures obtained here, that there is much correlation between the presence of albino seedlings and yield. The average yield of ear rows without albino seedlings is 66 bushels per acre, and of those containing these seedlings 65·8 bushels per acre.

A test of germination made with 10 grains from each ear gave the following results:—

19 ears germinated the whole 10 grains.
7 ears germinated 9 grains out of 10.
5 ears germinated 8 grains out of 10.

To find whether this germination test had any relation to the germination of the corresponding rows in the field, the figures were compared, and no definite correlation was found to exist.

Germination in test.	Percentage germination in field.
10	81
9	85
8	81

In this germination test, which was made in moist sand, a number of grains gave rise to albino seedlings, and the yields of the ears corresponding to those which had no albinos were compared with those in which albinos showed, with the following result:—

Albino seedlings in test.	Average yield of corresponding ears per acre.
0	67·0 bushels.
1	58·5 ,,
2	55·8 ,,

There was found to be definite relation between the germination test and the yield per acre of the different ears, those giving a high germination test yielding the highest.

Germination in test.	Average yield per acre.
10	67·5 bushels.
9	65·7 ,,
8	61·2 ,,

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*Albino seedlings are young plants which are devoid of any trace of green colour. They grow for a few weeks, and then die.

Improved Yellow Dent at Grafton.

The ear-row test at the Grafton Experiment Farm with this variety was sown on 15th December, 1916, in rows 5 feet apart and 2½ chains long. The check rows were sown with seed from five ears of very good type, which were obtained from the winning crop in the Clarence Pastoral and Agricultural Association acre yield competition in 1915, which was won by Mr. W. H. Paine, who obtained his seed originally from the Grafton Experiment Farm, and who has also won several prizes at the Grafton Show for selected ears with this variety. These check rows showed out very favourably with the ear-rows as regards yield, only six ears in the test giving an increase on their average.

The following table shows the yield of each row:—

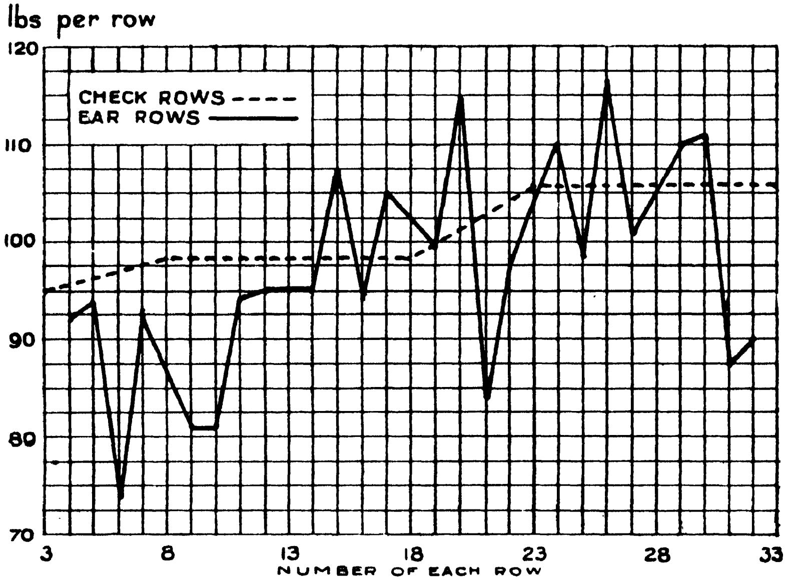
TABLE II.—Ear-row Test—Improved Yellow Dent—Grafton Experiment Farm.

Registered Ear Number.	Number of Row.	Germination, per cent.	Suckers, per cent.	Yield of Ear Corn per Row.
				lb.
heck ...	3	83	40	95
109 ...	4	87	36	92
112 ...	5	90	11	94
98 ...	6	89	4	74
103 ...	7	90	8	93
heck ...	8	87	29	98
93 ...	9	78	34	81
94 ..	10	89	9	81
108 ...	11	83	20	94
96 ...	12	91	8	95
heck ...	13	93	9	98
91 ...	14	87	31	95
92 ...	15	93	40	107
90 ...	16	92	10	94
88 ...	17	89	20	105
Check ...	18	88	24	98
86 ...	19	97	39	99
111 ...	20	86	49	115
113 ...	21	93	48	84
87 ...	22	93	10	98
heck ...	23	93	30	106
52 ...	24	93	25	110
78 ...	25	91	64	98
79 ...	26	94	30	116
76 ...	27	85	40	101
heck ...	28	......	......	106
89 ...	29	87	20	110
95 ...	30	89	15	111
106 ...	31	81	45	87
97 ...	32	89	35	90
heck ...	33	85	29	106

The range in yield of the ear-rows was from 74 to 116 lb., while the check rows varied only from 95 to 106 lb. The average yield of the plot was 74·7 bushels of shelled grain per acre, and that of the best ten rows 81·7 bushels per acre. Rows 24 to 27 inclusive were sown with the residues of the seed from the previous year's test, and gave an average increase of 4 bushels per acre over the other selected ears used in the plot. It must be remembered that this residue seed is two-year-old seed, but it has shown its superiority in spite of this. Another interesting observation is that this two-year-old seed gave a germination of from 85 to 94 per cent., a fact which proves that, if properly kept, maize seed will retain its viability quite easily for this period of time.

There is again some correlation between percentage of germination and yield, as will be seen from the following:—

Germination percentage.	Yield in bushels per acre.
Over 90	76·6
85 to 90	75·2
Under 85	67·4



Graph 2.—Showing yields of Ear-row Test of Improved Yellow Dent Maize at Grafton Experiment Farm, 1916-17.

The percentage of suckers is seen to be very much less than in the former variety (Leaming), and the relation between the percentage of suckers and yield is as follows:—

Per cent. suckers.	Yield in bushels per acre.
Below 20	72·6
20 to 40	76·5
Over 40	74·6

Here again it will be seen that the best yields are from rows with a comparatively high percentage of suckers.

In a germination test of 10 grains from each ear planted, the following results were obtained:—

18 ears gave a full germination.

6 ears germinated 9 grains out of 10.

The relation between the germination test and the row yield of the corresponding ear is thus shown:—

Germination in test.	Yield in bushels per acre.
10	75·0
9	74·0

Red Hogan at Hawkesbury Agricultural College.

The ear-row test with this variety was sown on the River Farm on 23rd October, 1916. The rows were 4½ feet apart, 220 links long, and 3 grains were sown every 5 links apart in the rows. The check rows were sown with a well-selected sample of farm seed.

The following table gives the yield of each row:—

TABLE III.—Red Hogan—Hawkesbury Agricultural College.

Ear Number.	Number of Row.	Yield of Ear Corn per row.	Ear Number.	Number of Row.	Yield of Ear Corn per row.
		lb.			lb.
Check ...	1A	69	*Check* ...	1C	73
81 ...	2A	72½	70 ...	2C	73½
94 ...	3A	82	83 ...	3C	88½
78 ...	4A	81½	74 ...	4C	73
95 ...	5A	87	88 ...	5C	68½
Check ...	6A	67½	*Check* ...	6C	61½
92 ...	7A	98	89 ...	7C	84½
71 ...	8A	95	72 ...	8C	100
87 ...	9A	76	90 ...	9C	68
75 ...	10A	85	76 ...	10C	89½
Check ...	11A	79½	*Check* ...	11C	69½
Check ...	1B	58½	*Check* ...	1D	75
Mixed ears	2B	61½	82 ...	2D	91
68 ...	3B	63½	96 ...	3D	88
59 ...	4B	68	80 ...	4D	55½
Mixed ears	5B	62	93 ...	5D	56
Check ...	6B	67½	*Check* ...	6D	65½
69 ...	7B	87	79 ...	7D	67½
84 ...	8B	90½	85 ...	8D	73½
77 ...	9B	71	73 ...	9D	67½
86 ...	10B	82	91 ...	10D	60½
Check ...	11B	69	*Check* ..	11D	58

The variation in yield between the ear-rows in this test is rather **great, and** this is an indication that the variety is still open to **considerable improvement** in yield by this method. The ear-rows yielded from 56 to 100 lb. in weight, while the range in the check rows was from 58 to 75 lb. The average yield of the plot was 65·3 bushels per acre, and that of the best ten rows 86·5 bushels.

Owing to the scanty sucker formation, which varied from about 5 to 8 per cent. in the rows examined, it was deemed unnecessary to collect this data for the whole plot.

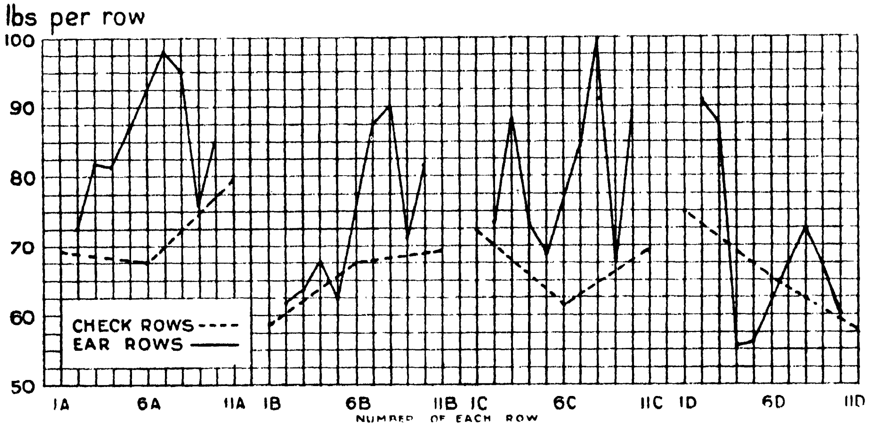
A test of stud seed of this variety, which has been bred up by this ear-row-test system against ordinary barn-selected seed, gave an increase of 11 bushels per acre in favour of the former.

A germination test of 10 grains from each ear used in the ear-row plot gave the following result.

20 ears germinated 10 grains out of 10.
4 „ „ 9 „ „ 10.
4 „ „ 8 „ „ 10.
1 „ „ 7 „ „ 10.
1 „ „ 6 „ „ 10.

After germination, the number of vigorous and weak seedlings were noted in each set, as follows:—

4 ears gave 9 vigorous seedlings.
6 „ „ 8 „ „
6 „ „ 7 „ „
3 „ „ 6 „ „
2 „ „ 5 „ „
5 „ „ 4 „ „
3 „ „ 3 „ „
1 „ „ 2 „ „



Graph 3.—Showing yields of Ear-row Tests of Red Hogan Maize at Hawkesbury Agricultural College, 1916-17.

The relation between the average yields of the individual ears and the germination test is here shown:—

Germination in test.	Yield in bushels per acre.
10	70·9
9	69·6
8	59·3
7	77·9
6	49·7

Excluding the last two figures, for which a comparable average could not be obtained, owing to there being only one ear of each which gave a germination of 7 and 6 grains respectively, it would appear that there has been a direct relation between the germination test and the average corresponding yield.

The relation between the percentage of vigorous seedlings and the corresponding average yield of the ear is still more striking:—

Vigorous seedlings.	Yield in bushels per acre.
9	73·3
8	71·6
7	70·8
6	68·4
5	68·2
4	67·3
3	55·5
2	60·3

Early Yellow Dent at Glen Innes.

The improvement plot with this variety at the Glen Innes Experiment Farm suffered severely through excess of rain in the early stages, and from a hot, dry spell at the tasselling stage. The yield was only 18 bushels per acre, and a sufficient number of good ears could not be obtained from it to carry on with. As the seed used was of exceptionally good type and quality, it is proposed to use the same again next season, sufficient of it being left as residue from planting this plot.

A germination test was made of the seed ears, as with the varieties previously mentioned, but owing to the low yield of the plot the variations in yield are not sufficient to afford grounds for comparison.

Boone County White at Berry.

In the improvement plot with this variety at Berry Experiment Farm the row weights were not recorded, owing to irregular germination, caused by continued wet and cold weather soon after planting. Some good ears were, however, selected from the plot, and these will be used for planting a special seed plot next season. When the results of an ear-row test are lost, as in this case, it must not be thought that the value of the plot is also reduced to nothing, for in the first place only the best seed is initially used, and this alone lessens the crossing from inferior strains, which would naturally take place on a larger field area; and secondly, the value of field selection from this seed plot should not be overlooked.

Hickory King at Emu Plains.

Good results were obtained with this variety at Emu Plains Irrigation Farm, an average of about 50 bushels per acre being obtained throughout. An unusually large percentage of stalks bore two ears, while some were also found with three good ears of about ¾ lb. each. Stalks with single ears up to 10 or 11 inches in length which were produced from this crop, were on exhibition at the last Royal Agricultural Show in Sydney, and they attracted considerable attention as being some of the finest specimens of this variety seen at the Sydney Show for many years. Some good seed of this variety has been obtained from South Africa during the year, and it is proposed to interpollinate this with our strain in order to infuse new vigour into the variety. "Running out" of this variety is likely to occur much sooner than with other varieties, owing to the distinctive type, which readily shows admixture by any other varieties.

Silvermine at Yanco.

Owing to the variable yields of the check rows of the ear-row test with this variety at the Yanco Experiment Farm, due to patchy germination, which could not be remedied by replanting the missing hills, the determination of the best yielding rows in this test could not be made. Getting a uniform stand for a test such as this is sometimes a matter of some difficulty with the conditions obtaining at Yanco, but it is proposed next season to sow about half as thickly again as is required, and thin out if necessary to a normal and uniform stand.

A germination test of 10 grains from the selected ears used is interesting for the comparison between them in vigour and readiness of germination:—

NUMBER of Grains Germinated.

Ear Number.	4 Days.	5 Days.	6 Days.	7 Days.	8 Days.	9 Days.	10 Days.
1	...	3	10	10	10	10	10
2	...	1	4	5	7	8	8
3	...	3	6	7	7	7	9
4	...	2	4	4	5	6	6
5	...	..	3	3	9	9	10
6	...	...	1	3	6	7	7
7	1	6	7	7	8	8	8
8	...	3	5	5	7	8	9
9	...	2	5	6	7	8	9
10	...	1	7	8	9	9	9
11	...	4	7	8	9	9	9
12	...	...	2	3	4	5	8
13	...	1	2	4	8	9	9
14	...	1	4	7	8	8	9
15	1	5	6	7	7	7	7
16	...	...	2	5	8	9	10
17	...	...	3	5	8	8	8
18	...	3	7	8	8	8	9
19	...	4	10	10	10	10	10
20	...	2	6	7	8	9	9
21	1	5	6	6	6	6	6
22	...	...	3	8	9	10	10
23	...	...	3	4	6	6	7
24	...	2	6	7	10	10	10

It will be seen that two ears (1 and 19) gave a full germination after six days, while there were some which germinated only 6 grains out of 10 at the end of ten days.

Funk's Yellow Dent at North Bangaroo.

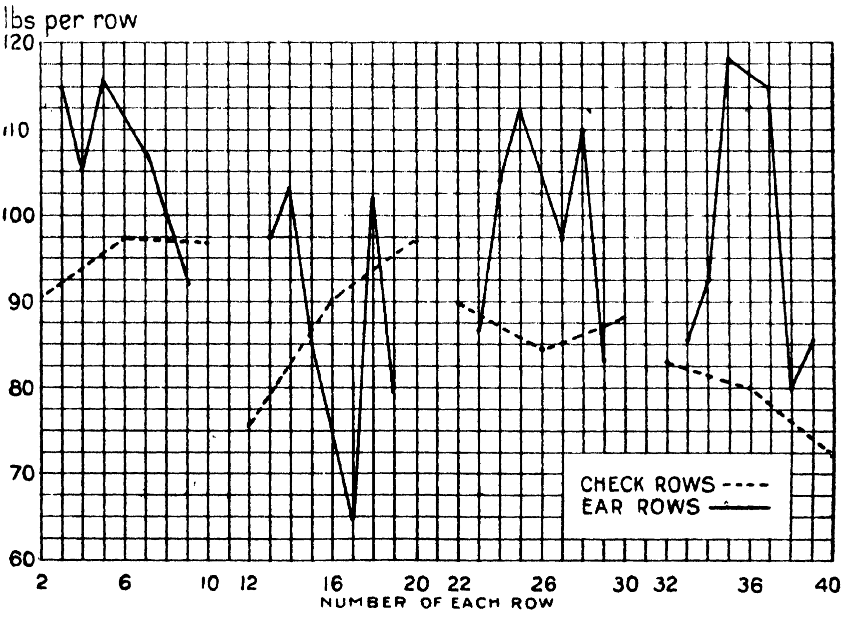
An excellent crop of this variety was obtained at North Bangaroo Horse Stud Farm. It is not naturally tall-growing, but here it attained a height of 8 to 9 feet at the tasselling stage, and averaged about 70 bushels per acre when harvested. Ears were obtained up to 11 or 12 inches in length.

Reid's Yellow Dent at Bathurst.

The growth of this variety was continued at Bathurst, on the River Farm, and some excellent ears were obtained. An acclimatised strain outyielded some special seed ears of American origin by 6 bushels per acre.

Leaming at Sherwood, Macleay River.

In addition to the improvement plots on the Experiment Farms, demonstrations were given in several instances to farmers of the method in use at these farms by carrying out the ear-to-row test with the variety they most largely grow on their own farm. One of these plots was sown on 26th September, 1916, on the farm of Mr. R. Laney, Sherwood, Macleay River. The ears used for the test were obtained from the Grafton Experiment Farm, and the rows sown were 4 feet apart and 180 feet long. As the length of the field used was over 12 chains, it was divided into four sections of ten rows each, and with a space of 10 links between each section, in which pumpkins were planted, which easily distinguished the ends of the rows. Check rows were sown in the second, sixth, and tenth rows in each section with mixed seed from about seven or eight selected ears of uniform type. The previous history of the plot showed that it had grown maize for over fifty years. The soil was a sandy alluvial, which had been improved of late years by having field peas ploughed in during winter or early spring. The last crop of field peas was ploughed in only about three weeks previous to planting. An application of 2 cwt. per acre of P7 fertiliser (equal parts of



Graph 4.—Showing yields of Ear-row Test of Leaming Maize at Sherwood, Macleay River, 1916-17.

superphosphate and bonedust) was made at planting. Four grains were sown in hills about 2½ feet apart in the rows, and the stand was later thinned to three plants per hill.

The weights of each row are given as under :—

Row.	Yield of Shelled Grain.	Row.	Yield of Shelled Grain.
	lb.		lb.
2 (*check*)	91	22 (*check*)	90
3	115	23	87
4	105½	24	104
5	116	25	112
6 (*check*)	97½	26 (*check*)	84½
7	107	27	97
8	99½	28	110½
9	92	29	83
10 (*check*)	97	30 (*check*)	88½
12 (*check*)	76	32 (*check*)	83
13	97½	33	85½
14	103½	34	92½
15	85½	35	118½
16 (*check*)	90½	36 (*check*)	80
17	64½	37	115
18	102	38	80
19	79	39	86
20 (*check*)	97	40 (*check*)	72

The average yield of the plot was 101·9 bushels per acre. This excellent yield is attributed to the good season and to the building up of the soil in humus by the previous additions of green manure provided by the growth of field peas. The best ten ears averaged 118 bushels per acre, and by planting the residues of these ears in a special seed plot next season, and breeding between them, the basis of a higher yielding strain of this variety is made.

Goldmine at Moruya.

An ear-row test with Goldmine, an early variety grown by Mr. A. Louttit, of Moruya, was carried out on his farm. The plot was sown on 27th October, 1916, in rows 3½ feet apart and 290 feet long; 2 cwt. P7 fertiliser was applied per acre. The soil is a sandy loam; and the previous crop for two years was red clover. Three grains were sown in hills 3 feet apart in the rows.

The following observations were made on the rows during growth:—

Row 5.—Was slightly later than rest of crop, and had thicker stalks.

Row 9.—Stalks about 2 feet shorter in height than adjoining rows. When harvested this row was found to contain considerable admixture of white and white-capped grains amongst the yellow.

Row 14.—Similar to Row 9 with regard to height of stalks and admixture of colour in grain.

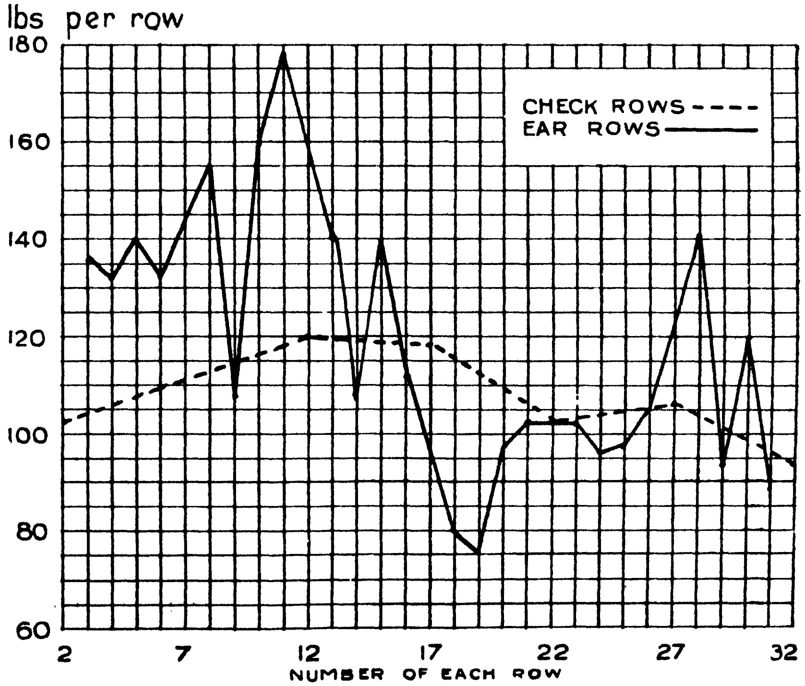
Row 18.—Stand thinned by cutworms.

Row 19.—Same as Row 18.

Row 23.—Weak stalks—lodging badly.

Following are the yields:—

Row.	Yield of Shelled Grain.	Row.	Yield of Shelled Grain.
	lb.		lb.
2 (*check*)	103½	17 (*check*) ...	118
3	135½	18	79½
4	131½	19	75
5	139½	20	97½
6	132½	21	102½
7 (*check*)	111	22 (*check*) ...	102½
8	155½	23	102½
9	107½	24	96
10	159	25	97½
11	178	26	106
12 (*check*)	120½	27 (*check*) ...	106
13	140	28	142
14	107	29	94
15	139½	30	120½
16	112	31	87
17 (*check*)	118	32 (*check*) ...	94

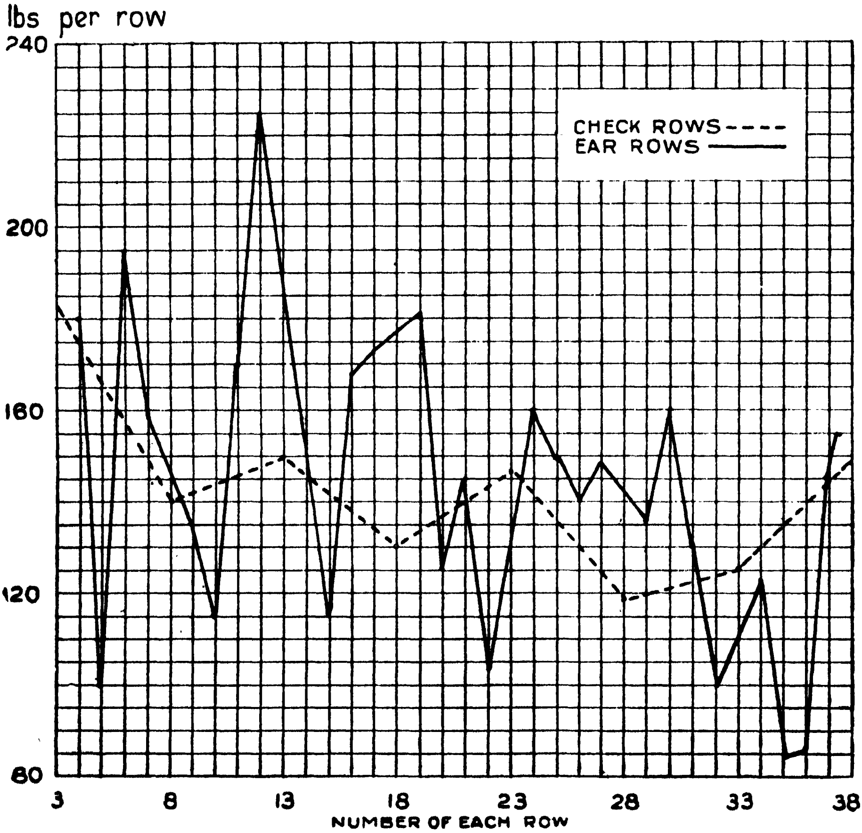


Graph 5.—Showing yields of Ear-row Test of Goldmine Maize at Moruya, 1916-17.

The yield of the plot averaged 87·4 bushels per acre, and that of the best ten rows 112·1 bushels per acre,—thus indicating that there is room for considerable improvement in yield by this method. The low yields from Rows 9 and 14 compared with their immediate neighbours, and the mixed colour of the grain from these rows, constitute a weighty argument for the necessity of greater care in selecting the original seed, especially as regards uniformity. Apart from the improvement in yield, which can evidently be effected by this method, this variety requires improvement in (1) colour of grain, which in many instances is too pale; in (2) regularity of rows, many of which are extremely irregular; and in (3) furrow between the rows of grain, which is mostly too wide.

Funk's Yellow Dent at Inverell.

An ear-row test with this variety was sown on the farm of Mr. J. Ditzell, Inverell, on 3rd November, 1916. The rows were 5 feet apart and 294 feet long. This variety is largely grown by Mr. Ditzell, as being particularly suited to the Inverell district—it having outyielded all other varieties tried against it in Departmental Experiment Plots for a number of years.



Graph 6.—Showing results of Ear-row Test of Funk's Yellow Dent Maize at Inverell, 1916-17.

The season was very wet and cool during the early part, and the crop struggled along very slowly in cold moist ground for five or six weeks after planting, when a spell of warm weather sent it along very rapidly. By the end of January, 1917, it was half tasselling and silking, and had attained a height of 8 feet.

The results of the test were as follows:—

Row.	Yield of Shelled Grain.	Row.	Yield of Shelled Grain.
	lb.		lb.
3 (*check*)	172	21	143
4	180	22	104
5	101	23 (*check*)	147
6	195	24	160
7	159	25	149
8 (*check*)	140	26	141
9	134½	27	149
10	115	28 (*check*)	119
11	171	29	136
12	225	30	161
13 (*check*)	150	31	130
14	150½	32	101
15	115	33 (*check*)	126
16	167½	34	123
17	174	35	84
18 (*check*)	130	36	86
19	181½	37	145½
20	126	38 (*check*)	148

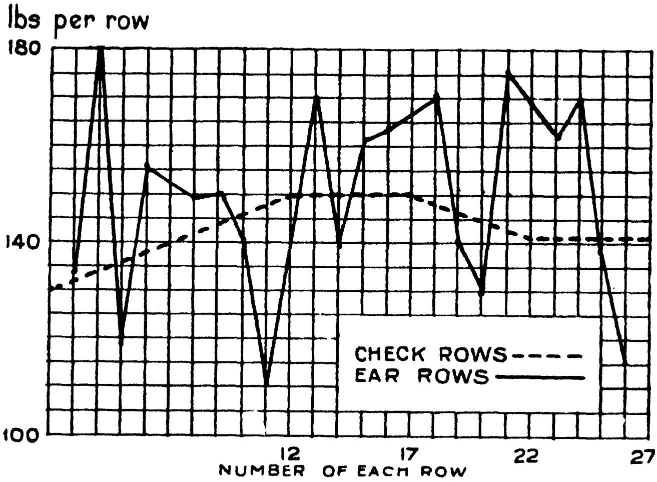
The average yield of the plot was 75·8 bushels per acre, and that of the best ten rows 93·9 bushels per acre. Row 12 stood out very conspicuously as a very heavy yielding row—its computed yield per acre being 119·1 bushels. The range in yield between the different ears is here also very high, and indicates that much improvement in the yield of the variety can be made by the elimination from next year's breeding plot of all those ear-residues which have given poor or only moderate performances in this test.

Improved Yellow Dent at Coramba.

An ear-row test with Improved Yellow Dent was also carried out on the farm of Mr. M. O'Connell, Coramba. This plot was sown on 20th November, 1916, with rows 4½ feet apart and 4 chains 20 feet in length. Much difference was observable between the rows during growth, and the results were as follows:—

Row.	Yield of Ear Corn.	Row.	Yield of Ear Corn.
	lb.		lb.
2 (*check*)	130	15	162
3	133	16	164
4	181	17 (*check*)	150
5	117	18	172
6	166	19	140
7 (*check*)	139	20	129
8	150	21	176
9	151	22 (*check*)	141
10	142	23	162
11	111	24	170
12 (*check*)	150	25	138
13	172	26	115
14	139	27 (*check*)	141

The average yield of the plot was 73·7 bushels per acre, the shelling percentage (grain per ear) being 82. The best ten ears averaged 82·9 bushels per acre, an increase of 9·2 bushels over the plot average.



Graph 7.—Showing yields of Ear-row Test of Improved Yellow Dent Maize at Coramba, 1916-17.

Conclusions.

The extension of the ear-row test to Farmers' Plots is a successful feature of the year's work, and much interest was aroused in some districts by this new method of obtaining higher yielding strains of maize. The only drawback to the institution of these plots amongst farmers is the time involved in harvesting and weighing each row separately. It will readily be seen that these tests are the more valuable the greater the number of ears which are used in the test. After some years of experience with these tests, the following suggestion can be made which will allow of a very large number of ears being tested without the trouble of the separate harvesting and weighing—that is, that an experienced grower can test up to 100 or more ears in these individual rows in the field, and can determine the best yielding rows by a thorough field examination. No actual figures as to yield are obtained, but the best rows can be determined in this way with sufficient accuracy for the purpose.

Farmers' Bulletin No. 72, "Spraying." (Third Edition.)

A THIRD edition of this useful publication has just been issued, and every fruitgrower should become conversant with the latest recommendations of the Fruit Expert (Mr. W. J. Allen) in connection with this important subject. Copies may be obtained free on application to the Under Secretary and Director, Department of Agriculture, Lands Building, Sydney.

Grass Experiments at Hawkesbury Agricultural College, 1916-17.

W. D. KERLE, Experimentalist.

The Season.

THE season experienced during the twelve months ending 30th June, 1917, was directly opposed to that of the corresponding period last year. During the latter the severest drought on record was experienced, while in the former the spring and summer rains were above the average. In October the Hawkesbury River overflowed its banks, and inundated the low-lying river flats for some days.

The winter of 1917 has, however, been exceptionally dry, and frosts severe and frequent. Summer and spring grasses, therefore, made excellent growth, while winter grasses have been heavily handicapped.

The rainfall from August to July, 1915-16, was 16·915 inches, and for the same period 1916-17 was 29·610 inches. The latter was distributed as follows:—August, 1916, 1·200 inches; September, 1·325; October, 7·580; November, 3·805; December, 3·860; January, 1917, 2·730; February, 3·510; March, 0·690; April, 2·740; May, 0·310; June, 1·475; July, 0·385; total, 29·610 inches.

The Experiments.

The grass experiments are divided into two sections, viz.:—

(1) Grass Row Trials. (2) Field Grass Trials.

The Row Trials.

These were first established in April, 1913, in Block 1A. The rows are 116 links in length and 2½ feet apart, and comprise seventy varieties of grass and fodder plants. The objects of these trials are:—

(1) To determine the suitableness to the district of the common native and introduced grasses.
(2) To determine the value of newly-introduced grasses.
(3) To improve varieties by selection.
(4) To provide grasses for exhibition purposes.
(5) For educational purposes generally.

During the period under review the following new grasses underwent trial:—

Pennisetum massaicum.
Pennisetum tristachya.
Setaria nigrirostis (South African Pigeon grass).

Pennisetum massaicum.—On 31st March, 1916, two rows of this grass were sown, numbering in all eighty plants, forty-one of which grew. They remained dormant during the winter months of 1916, and on the advent of spring commenced to grow slowly, and by the end of November were

12 inches in height. Growth was more rapid in the summer months, and by the middle of May they were 2½ feet in height. They stooled very well, with an average of twenty-five stems per root. The stems are comparatively thick, at the base amber coloured, and for the most part proliferous at the joints. The flower heads are small (1 inch x ¼ inch diameter), and carried on a bare stalk 9 to 12 inches in length.

The foliage resembles that of Couch grass (*Cynodon dactylon*), but is a lighter green in colour. The leaves are thin and sparse. It withstood several severe frosts of early winter, but was eventually cut down owing to a succession of exceptionally heavy frosts. The grass appears worthy of more extended trials, particularly in the dry districts of the State.

Pennisetum tristachya.—One row of this grass was sown on 9th November. 1916. It is a native of Brazil, and said to be a fine fodder grass, but did not justify that claim in last season's trial, being a very poor grower, coarse and scanty in foliage, and an indifferent stooler.

Setaria nigrirostis (South African Pigeon grass).—This grass has been established some time, and in May of this year was 5½ feet in height. It is a very strong grower in the autumn, but is quickly cut down by frosts. The foliage is harsh, the stems coarse, with large joints. It stools very well, and makes a quick, strong growth, responding immediately to rain. From a fodder point of view, its coarseness detracts from its value.

The Field Trials.

The trials were established in 1913 with the object of testing under ordinary field conditions those varieties found in the row trials to be suitable to the district and worthy of extending. Seed reserve areas are also thus established, and the seed of the best plants used for Farmers' Experiment Plots and for distribution generally. Each plot is one-seventh acre in extent, and the soil is a light volcanic loam of comparatively uniform composition.

The following plots were laid down in 1913:—

Eragrostis curvula (var. *valida*) (a Love grass).
Andropogon intermedius (Rare Blue grass).
Eragrostis leptostachya (Paddock Love grass).
Paspalum dilatatum.
Chloris gayana (Rhodes grass).
Anthistiria avenacea (Tall Oat grass).
Bromus inermis (Awnless Brome grass).
Bromus unioloides (Prairie grass).

Additions to the trials have been made as follows:—

1914.—*Pollinia fulva* (Brown Top or Sugar grass).
1915.—*Bromus inermis* (three strains).
Phalaris bulbosa (Toowoomba Canary grass).
1916.—*Schedonorus Hookerianus* (Hooker's Fescue).
Festuca arundinacea (Giant Fescue).
Pennisetum purpureum (Elephant or Napier's Fodder grass).
Andropogon sorghum var. (Sudan grass).
1917.—*Deyeuxia coarctata.*

Eragrostis curvula.—Owing to the coarse nature of this grass and its unsuitableness for stock feed here further trials were considered unnecessary, and the plot was ploughed out on 14th May, 1917.

Andropogon intermedius (Rare Blue grass, native).—Growth was very satisfactory, giving when mature a yield of greenstuff of 3 tons 18 cwt. per acre. It was 3½ feet high when cut. It gives the highest yield of succulent forage of any of our native grasses. Its chief merits are drought-resistance, succulence, palatableness to stock, and free seeding.

Eragrostis leptostachya (Paddock Love grass, native).—Grew to a height of 2 feet. Although not producing a big weight of forage it is a very hardy native grass which seeds freely, and forms the bulk of our natural pastures here. The weight of green fodder on the plot was estimated at 2½ tons per acre. It is a grass that responds very quickly to the smallest fall of rain, and will stand heavy stocking.

Paspalum dilatatum.—The early part of the season, being comparatively wet, was admirably suited to paspalum. It grew to a height of 5 feet, and yielded 6 tons 2 cwt. 3 qrs. of greenstuff per acre. Such seasons being rather the exception than the rule in this locality, *Paspalum dilatatum* is not strongly recommended, since, under dry conditions, it practically remains dormant.

Chloris gayana (Rhodes grass).—This grass attained an average height of 4 feet, and gave a yield of forage of 5 tons 5 cwt. 2 qrs. per acre. It can always be relied upon to make a fair growth, whether the season be dry or wet, but it is not readily eaten by stock here, owing, no doubt, to the distinctly sour taste it possesses.

Anthistiria avenacea (Tall Oat grass, native).—Owing to the coarseness of its stem and foliage and its poor seeding capabilities this native grass cannot be recommended. It is very tussocky in habit and resistant to drought. It grew to a height of 5 feet 3 inches, but was long and spindly, with scanty foliage, and yielded 5 tons 1 cwt. of greenstuff to the acre.

Bromus inermis.—This grass is characterised by underground creeping root stocks and leaves of a dirty dark-green colour. It grew well in the spring, but tends rather to the formation of tussocks than to tall growth. The foliage is soft and fairly abundant, and relished by stock. It does not appear to be particularly adapted to the coast, but does well on the Northern and Central Tablelands, and on the Irrigation Area. It attained a height of 2½ feet, with an estimated yield of 3 tons 5 cwt. of greenstuff per acre.

Bromus unioloides (Prairie grass).—The plot has given very satisfactory results since its establishment in 1913. Although an annual, it has with us become perennial in habit. In the winter of 1917 it made very little growth owing to the comparatively low rainfall. Usually it is our most reliable winter and early spring grass. Its chief merits are its resistance to frost, free seeding habit, and succulence and palatableness to stock. Its chief fault lies in its inability to stand heavy grazing.

Pollinia fulva (Brown Top or Sugar grass, native).—This grass was first sown in 1914, and this season, consistent with previous years, gave excellent results. It grew to a height of 3 feet, but is not in habit a tall grower. Its foliage is soft and abundant, and it is particularly relished by stock. It gave an estimated yield of 4 tons 2 cwt. per acre.

Phalaris bulbosa.—On 22nd July, 1915, this grass was sown from seed in the Field Trials, and in the winter and spring of 1916 it did better than any other. It grew to an even height of 5½ feet, and gave an estimated yield in August, 1916, of 7½ tons of succulent green fodder per acre. A portion was harvested for seed, yielding at the rate of 85 lb. per acre, a plump bright-coloured grain, which gave a high percentage of germination in the 1917 sowings. It is easy to harvest and to thresh. *Phalaris* does not stand the hot dry summer months too well, but during the dry winter we have just experienced it has grown to a height of 18 inches. Another plot, sown on 3rd April, 1917, has also grown well through the winter. At the end of July it was 10 inches high, of a dark-green colour, and a mass of soft and succulent leaves.

By its performance since 1915 we can regard it as the most satisfactory winter and early spring grass we have, owing to its resistance to frost, yield of succulent and palatable green fodder, and ability to make an excellent hay.

Schedonorus Hookerianus (Hooker's Fescue, native).—Four rows of this grass were included in the Field Trials in the autumn of 1916. At the end of July, 1917, it was 12 inches high, and of a dark-green colour. It withstood the severe frosts remarkably well. It is probably hardier than *Phalaris bulbosa,* but the foliage is very harsh, and not nearly so palatable and nutritious. This is a native grass, and characterised by frost and drought resistance. It is well adapted to elevated localities.

Festuca arundinacea (Giant Fescue).—The behaviour of this grass in the Row Trials seemed to justify its inclusion in the Field Trials in the autumn of 1916. It, however, has not made much growth, and at the end of the winter of 1917 was only 10 inches high. It has a rather coarse appearance, and does not seem to be particularly suited to our conditions.

Deyeuxia coarctata.—Five rows of this grass were planted on 1st May, 1917. Every plant took root, and at the end of July had stooled out remarkably well. It was then 4 inches to 5 inches high, with foliage very soft and succulent, and of a light green colour, which, considering the meagre rainfall and the severe frosts of the winter, speaks well for its future prospects. Its behaviour in the summer and winter of 1918 will be interesting to note, for it should by that time be firmly established.

Pennisetum purpureum (Napier's Fodder or Elephant grass).—On 28th June, 1916, twenty cuttings of this grass were sown in rows 6 feet apart each way. Since that date the plot has been extended to four rows, each 76 yards long. Fifteen of the original cuttings rooted, and on the advent of spring (1916) grew very rapidly. On 12th December the plants had stooled out to an average of twelve stems, each about 4½ feet in height.

Growth in the summer months was excellent, and on 1st February it was 10 feet to 11 feet high, and with an average of sixty to eighty stalks per stool. On the 14th of that month a palatability test of chaffed and unchaffed stalks was conducted with stall-fed dairy cows. In a chaffed condition they ate it readily, but in the rough state ate the leaves but refused the coarse stems.

From eight to nine months after planting it came into ear, but did not set any seed. From the fifteen clumps a yield equal to 21 tons per acre was obtained.

It is a strong-growing, sorghum-like grass with coarse, pithy, non-saccharine stems. The leaves are long and broad, numerous, and of a light-green colour. The stems also are proliferous, this growth being particularly appreciated by stock, owing to its greater fineness and succulence. The ears are approximately 6 inches long by 1 inch in diameter at the base, and tapering. Its failure to set seed is not a serious detriment, owing to the ease with which it may be propagated by cuttings or roots.

Andropogon sorghum, var. (Sudan grass).—Trials have been continued this season. A plot approximately half an acre in extent was sown on 18th December, 1916, in drills 3 feet apart, at the rate of 8 lb. of seed per acre. It gave a first cut on 1st March, 1917, of 3 tons 17 cwt. 3 qrs. 15 lb. per acre on a rainfall of 6·855 inches, and a second cut on 20th April of 2 tons 12 cwt. 1 qr. per acre on a rainfall of 1·25 inches, or a total of 6 tons 10 cwt. 0 qr. 15 lb. for the season. A section left for seed threshed at the rate of 623½ lb. per acre.

Compared with Hungarian Millet growing in the same block, it gave an increase of 10 cwt. 3 qrs. 13 lb., besides, owing to its finer, sweeter, and more succulent foliage, being a much superior feed for all classes of stock.

The production of 2 tons 12 cwt. 1 qr. of greenstuff per acre on a fall of 1·25 inches, and its yield of 2 tons 8 cwt. when other crops practically failed during the drought of 1916, are evidences of its drought-resisting capabilities.

Sudan grass closely resembles Johnson Grass (*Sorghum halepense*), but it is an annual, with a fibrous root system, which distinguishes it from that grass and eliminates any possibility of it becoming a weed pest. It is primarily a hay or soiling crop, and in the semi-arid districts of the State two cuttings a season may be expected; but under more favourable conditions a third may be obtained. It is quick in maturing, yielding its first cut in seventy to eighty days and its second in forty to fifty days. It is possible with such a short growing period to harvest a crop before drought in the summer.

It was harvested this season with the maize binder, but could be more successfully and expeditiously cut with the wheat binder.

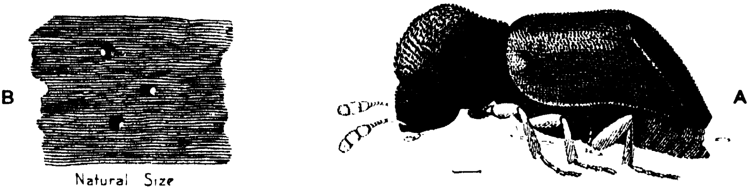
Sudan grass can safely be regarded as capable of producing a higher yield of forage under drought conditions than any other summer crop tried here, and under more normal conditions superior to all other grasses as a hay and soiling crop.

A LEAD-BORING BEETLE (*Xylothrips gibbicollis*).

SEVERAL years ago a perforated section of the lead sheathing used to protect overhead telephone wires was brought to the Entomologist's office, with a request that the cause of the circular hole might be ascertained. At that time the writer gave it as his opinion that the damage was caused by some small wood-boring beetle allied to the "shot-hole borer," common in some of our hardwood timbers.

Mr. A. A. Dircks, Chief of the Electrical Lines, Postmaster-General's Department, has furnished me with a record of sixty-seven cases in the metropolitan area, ranging from Parramatta, Ryde, and Hunter's Hill to Randwick, Newtown, and Mascot, where this damage has been discovered in the lead sheathing.

Last February Mr. C. H. Dumbarton, of the Lines Construction Branch, was fortunate enough to obtain some freshly-infested lead, with two of the beetles at work in the perforations. On examination with a lens, the marks made by the jaws of the beetles could be distinctly seen upon the surface of the walls of the burrow. The beetles, of course, do not eat the lead, but simply bore through it, dropping the particles as they cut through into the cavity beyond. There seems no reason why these beetles should adopt such a curious habit and expend so much energy to obtain access to the chamber containing the telephone wires. Flying along, they probably alight accidentally, and go exploring to see if there is anything good to eat behind the lead.



A Lead-boring Beetle (*Xylothrips gibbicollis*).

A. The mature insect (much enlarged). *B*. Lead showing small circular holes made by the beetle.

This beetle, which is closely related to a number of well-known wood-boring species, has been identified for me by Mr. A. M. Lea, of the Adelaide Museum, as *Xylothrips gibbicollis,* a Bostrychid beetle, described originally from Southern Queensland by Macleay, under the name of *Bostrychus gibbicollis,* but now known to have a wide range over Australia. This little beetle is of a reddish-brown tint, lighter coloured on the head, and of the characteristic form of the members of the family *Bostrychidæ,* as can be seen by the illustration. Under ordinary conditions it bores into dead and dying trees, depositing its eggs in the timber, upon which both the larvæ and adults live. One of the largest species is known as the "auger beetle," on account of the way in which it can cut a circular hole through a dead wattle branch.

Mr. Dumbarton informs me that on every occasion the perforation is made it permits moisture to enter the cable and destroy the insulation of the wires, thus disorganising communication. Each minute hole has then to be located before the lines can be again put in order. It seems almost hopeless to propose any method to prevent this little pest from attacking the lead. The cost of painting the cable with any repellent mixture, even if successful, would be too great.—WALTER W. FROGGATT, F.L.S., Government Entomologist.

Feeding Experiments with Wild Melon Fruit.

SYDNEY DODD, D.V.Sc., F.R.C.V.S., Lecturer in Veterinary Pathology and Bacteriology, University of Sydney.

THE fruit of the wild melon, or "paddy" melon (*Cucumis myriocarpus*) is firmly credited by many stock-owners, especially in the western districts of the State, in addition to those in other parts of Australia, with being the cause, when eaten, of serious effects in animals, notably blindness and injury to nerves. The latter is said to be shown by partial paralysis, or, when the injury is slighter, an incoördination of muscles, especially those of progression, indicated by uncertain gait when walking. The vine of the melon is also considered to be harmful, but more from mechanical effects through its indigestibility and accumulating in the stomach and intestines in the form of balls, rather than from any poisonous action. In South Africa the fruit has been credited with being poisonous to sheep, and a case is on record where the death of a child was attributed by the medical attendant to eating some of the fruit of this plant.

Several feeding and inoculation experiments have been conducted in Australia and South Africa with wild melon fruit in the endeavour to prove it innocent or guilty of the charge of being harmful, and the results have been entirely negative. It is necessary to point out, however, that in these cases the feeding experiments appear to have been conducted with too little material and for too short a period to permit of even the negative conclusions being drawn. In Australia, the condition which the ingestion of the wild melon is said to set up is evidently a chronic one, viz., blindness or injury to nerves. This, of course, indicates that the melon must be eaten for some time before the reputed ill effects could be observed. It is therefore evident that if any conclusion of value is to be arrived at, the experiments would need to be conducted over a fairly long period, if possible, during the season the melons are procurable.

Dr. Gilruth conducted a few years ago, in Victoria, some feeding experiments with wild melons on a horse, but I do not think the results were published. He, however, informed the writer at the time that he had not succeeded in producing any apparent injurious effect upon the eyesight of the horse experimented upon. The writer does not know how long the experiments were conducted, nor the amount of melons eaten daily, consequently the remarks concerning the other experiments cannot apply in his case.

The weak links in the experimental evidence were also recently noted by a stock-owner when corresponding with the Department of Agriculture on the subject. He stated that he considered the ill effects of eating the wild melon fruit resulted from prolonged feeding upon it, and that the brief experiments he had read of in the *Agricultural Gazette* proved nothing.

During June last the writer had occasion, on behalf of the Stock Branch of the Department of Agriculture, to visit the North-Western district in order to investigate certain deaths in sheep. Post-mortem examination showed, beside other things, that the animals had been feeding pretty extensively upon wild melons. Now such an occurrence by no means proved, or even indicated, that the wild melons had been the cause of death, but it was thought worth while to conduct some feeding experiments with this fruit in order to ascertain whether it was really injurious or not. [It may be stated here that it was shown that the melons were not the cause of the disease then under investigation.]

For this purpose, through the kind offices of the Chief Inspector of Stock, Mr. S. T. D. Symons, M.R.C.V.S., supplies of fruit were sent me by Stock Inspector White, Narrabri; Stock Inspector Hessin, Burren Junction; and Stock Inspector Lucas, Nyngan, from 3rd July to 20th September, 1917. The experiments had to be concluded when the consignment of the latter date was finished, as no more melons were to be obtained, the fruit having rotted on the ground.

During the experiments about to be described, none of the animals ate the fruit voluntarily unless it was mixed with other material, *e.g.*, bran. In the case of the horse, after having crushed one or two in its mouth, it refused to touch any more until mashed up with bran, when no further trouble was experienced.

With the sheep the fruit were given whole, simply by putting them in the animal's mouth, and then lightly placing the hand over the latter whilst they were being crushed, in order to prevent them being ejected as they would otherwise have been. This latter device acted well whilst it was conducted personally; but owing to other matters having to be attended to, the feeding had to be left to an inexperienced assistant, with a result which was not due to the poisonous character of the melon.

Experiments with Guinea-pigs.

The first experiments were conducted with guinea-pigs and a sheep, and the following are the details :—

3rd July, 1917.—Commenced feeding two guinea-pigs with wild melon fruit mashed up with bran. The animals refused to touch the fruit separately, and ate very little even mixed with bran.

Guinea-pig No. 101.—9th July—animal not so lively as usual. Hairs appeared ruffled instead of the usual smooth character.

10th July—animal distinctly worse; dull; coat staring; when taken out of the cage it sat still instead of endeavouring to escape; no notice taken of sudden movements; it, however, made some attempt eat a little grass which was placed before it. At noon the same day, the animal was found prostrate on the floor of its cage; quite comatose; there were no convulsions. The animal lay in this condition, with the exception of occasional convulsive movements with the legs, with, however, no rigidity, until 2·30 p.m., when it was chloroformed to death.

Autopsy.—Condition thin; no food in stomach and very little in bowels; no pathological changes to be noted anywhere.

Guinea-pig No. 102.—Commenced feeding with wild melon mashed up with bran, 10th July.

12th July—coat staring; animal dull; hungry; ate food other than that of the melon mixture with avidity. 13th July—10 a.m., animal quite prostrate; breathing very faint; not comatose, as when lifted up it made attempts to escape; no convulsions; no rigidity of limbs; when placed upon a table it lay as if dead, with the exception of an occasional gasp, until 12·30 p.m., when it was killed by chloroform.

No pathological changes could be observed at the post mortem.

Subsequently another guinea-pig was fed for nearly a month in the same manner, but beyond showing a little indisposition, *e.g.*, staring coat, the animal remained unaffected. In this case the feed was occasionally supplemented with a little grass.

Experiment with a Sheep.

Sheep No. 38, aged wether.—Fed twice daily from 12th July to 2nd August with whole wild melons. The amounts varied from twenty melons weighing 87 grammes to seventy-one melons weighing 300 grammes each feed, most frequently the larger amount. (In the experiments by other workers already alluded to only the number of melons given is stated, not the total weight they constituted. The information thus afforded is not of much value for comparison, as the size of the fruits varied very considerably—*e.g.*, the number of melons in 1,000 grammes varied from 157 to 410.)

During the feeding experiments an ample supply of lucerne was always before the animal to eat if it desired. On the fourth day after feeding the animal appeared dull, and with slight appetite. Until 25th July the health of the animal appeared to vary, at times being quite bright, but usually dull, and with a capricious appetite. About this period, the thirteenth day after commencement of experiment, the animal began to vigorously resist attempts to administer the melons. The lips became very sore and slightly excoriated, apparently due to an irritant principle in the skin of the fruit. About this period, too, pneumonia set in, apparently due to some of the seeds of the melon going down the trachea during the struggles during feeding. On 2nd August, during my absence from Sydney, the animal died suddenly whilst being fed. A post-mortem examination was made, and three whole melons were found in the trachea. It is evident that the animal was asphyxiated. No notes of the autopsy were made, consequently I am unable to give any opinion as to what effect, if any, the melons had upon the animal.

Remarks on the Experiments.

In the case of the guinea-pig experiments, two of the animals died and the other showed no apparent ill effect as a result. At present it would not be justifiable to draw any conclusions as to the injurious effects of the melons from such results. With the animals that died it is a question as to what degree the absence of sufficient nutriment contributed to the fatal result, the surviving animal having been given a small amount of other food not mixed with melon. Another point arises, viz., whether the degree of ripeness of the melon fruit has any bearing on the effects when eaten. The two guinea-pigs which died were fed on fruit not quite ripe, whilst the animal which was unaffected had only well ripened fruit. This point will be referred to subsequently.

In the case of the sheep, there appears no doubt that the melon, probably the skin, contains an acrid principle which is injurious, when undiluted, to delicate mucous membranes. It is possible even that if eaten alone it can cause rather severe inflammation of the intestines. There was, however, during the experiment no indication of any impairment of vision or of locomotion. Seeing that the animal died as the result of an accident, no conclusions can be drawn from the experiment bearing upon the objects with which the work was carried out.

A Second Series.

The second series of experiments were carried out with a horse and rabbits. In all cases the melons had to be mashed up with bran before the animals would touch them.

Two rabbits were fed for about a month with as much of the above mixture as they cared to eat. The daily amount taken was, however, much below their average of ordinary food, showing that the mixture was not palatable.

Beyond a little indisposition—*e.g.*, staring of the coat—nothing abnormal was noticed in them.

Experiment with a Horse.

A horse was fed in the same manner with melons from 1st August to 20th September inclusive. From the 1st to 28th August the amount given was 1,000 grammes per day in two feeds (equal to about 2 lb. 2 oz.), the number varying from 172 to 410 daily. From 29th August to 20th September inclusive the daily amount of melons was increased to 2,000 grammes (about 4¼ lb.) in two feeds, the number varying from 157 to 400. The fruits were very much larger than those fed in August, hence the disparity in total number daily. The animal was able to get ample green feed in the paddock during the experiment. The experiments had to be discontined on the 20th September, as no more melons were to be obtained.

The result of this prolonged feeding was quite negative, no impairment of vision being observed, nor any signs of nerve affection—the animal during the investigation, and subsequently, feeding and looking well.

Conclusions.

With regard to the feeding experiments upon the horse, the amount given daily, and the duration of the experiment should meet the objections that the work had not been carried on sufficiently long or with enough material. If the melons were going to produce any effect at all, one would expect to see something of it in the time occupied; and in connection with this it has to be remembered that the period during which melons may be obtained by the animal naturally, is not an unduly prolonged one every year.

Apparently, not all stockmen are convinced of the harmful nature of the wild melon fruit, for Stock Inspector Hessin, of Burren Junction, states that drovers, when they camp at night near the town, are in the habit during the season of gathering the wild melons in sacks for the purpose of feeding to their horses.

The conclusion that one can draw from the foregoing work is that prolonged feeding on relatively large amounts of wild melon fruits daily does not produce blindness, nor any noticeable disturbance of the nerve functions. As to whether they can produce any other trouble in sheep, *e.g.*, enteritis, is a matter on which the evidence is at present insufficient to make any judgment.

Finally, it may be added that extracts have been made in various ways from the melons, and injected in varying amounts into guinea-pigs without producing any ill result. This merely confirms the findings of previous workers.

Since carrying out the foregoing investigations, several stock-owners, &c., with whom I have discussed the matter have suggested that the harmful properties of the melons may be present in them when they are unripe, but that these properties disappear when the fruit ripens. The majority of the fruits sent me were quite ripe, but those received at the beginning were mainly unripe, and most of these were fed to the two guinea-pigs which died. There may be nothing at all in the suggestion, but at any rate it is worth investigating, and it is proposed to do so next season, given the opportunity.

NINE REASONS FOR MILK RECORDS.

ACCORDING to the Louisiana State University, there are nine convincing reasons for keeping records of dairy cows. They are equally true of New South Wales:—

1. They enable the dairyman to feed each cow according to the quantity of milk she produces.
2. They form the only basis on which a dairy herd can be improved. The time is here when no dairyman will buy a herd bull whose dam does not have an authentic record, showing creditable milk and butter-fat production.
3. Records alone will sell cows when no other quality will. Grade cows with records can be sold for from 25 to 50 per cent. more than those without records.
4. A system of records is the first step in building up a herd. The unprofitable cows are the most expensive. Their heifer calves are usually low producers, and should not be raised.
5. Records stimulate better feeding and breeding. The dairyman who keeps records usually keeps a balanced ration and becomes interested in winter dairying, which has numerous advantages over breeding cows to freshen in the spring.
6. The weighing of the feed and milk keeps the owner in close touch with the daily condition of each cow.
7. Records stimulate better milking. Milk scales serve as a check on the milker, and induce him to milk the cows more thoroughly than when the milk is not weighed.
8. A knowledge of what each animal is doing develops personal pride and interest in the herd.
9. Finally, records make dairying a business proposition, and in various incidental ways mean more dollars to the man who milks.

Export of Cheese to the United Kingdom.

THE Agent-General for New South Wales in London reports that a certain proportion of the stocks of cheese purchased by the Imperial Government from Australia is being released for the use of the civilian population. The retail distribution is being carried out through the ordinary retail trade channel at 1s. 4d. per lb. One condition of sale that is most important to our manufacturers is that the distributor must *prominently* display a Government label, showing the country of origin of the cheese, in accordance with the following specimen, viz. :—A notice printed on cardboard, size 8 x 10 inches, in 1-inch letters :—

GOVERNMENT CHEESE
per 1/4 lb.
The produce of
NEW SOUTH WALES.

This is the first occasion on which New South Wales produce has thus been brought directly under the notice of the consumer.

In view of the advertisement this State is thus getting, the following notes containing some suggestions made by the Acting Dairy Expert of the Department are of interest :—

It behoves manufacturers to put on the market an article of the best possible quality, as the reputation now being gained will influence sales for years to come. The Imperial Government in all probability will again purchase our output for the coming season, and it is therefore to the distinct advantage of all New South Wales factories to produce the best grade of cheese and market it in the most attractive manner. Cheese of poor quality, badly packed, and lacking uniformity of size, will have a prejudicial effect on the reputation of the produce of the State as a whole, even though a good percentage of the output proved equal to any from New Zealand. The time is now opportune for manufacturers to make good their name for choicest quality. This reputation will stand New South Wales factories in good stead in the future, when competition is likely to be very keen for the London market.

For ordinary trade purposes large cheeses weighing 70 lb. to 80 lb. each find most favour. The medium and loaf sizes, which are manufactured here for local sale, are not in great demand in London.

It would be advisable for each factory to use a distinctive brand, and when putting the necessary marking on the crate this brand should be an outstanding feature. Packing should also receive attention. Last season many crates that were quite unsuitable for such a lengthy journey were despatched. For such packages fairly stout timber should be used, which should be well and strongly put together and wired. There should be no waste space between the top of the cheese and the crate. Where two 80 lb. cheeses are packed in one crate, as is the custom, a division should be made so that each cheese may be in its own compartment, and the weight of one may not rest upon the other.

In order that this unique opportunity (which may never occur again) may be taken advantage of to establish a reputation for good quality of New South Wales cheese, steps are being taken by the Department of Agriculture whereby additional expert instruction may be imparted to all those engaged in the manufacture of this commodity. In this connection certain recommendations as regards crating and marking cheese packages are made.

Specification of Crates Recommended for the Export of Cheese from the Commonwealth of Australia.

CRATE FOR LARGE CHEESE.

The crate shall consist of an eight- or twelve-sided package, the latter preferred. The outside length of the package should be about 27 inches, and its breadth 15 inches. These measurements would vary slightly according to the shape of the cheese.

The timber used should be as follows :—Length of batten 27 inches, width of same 3¼ to 3½ inches, thickness ⅜ to ⅝ inch, the edges of these battens being bevelled.

The ends of the crate should, when dressed, be at least ⅞ inch thick, and the centre boards not less than ¾ inch thick.

The crate should be bound at each end and centre with galvanised wire of 14 gauge, and fastened with ¾ inch x 14 gauge staples.

The nails to be used are 1¾ inch x 13 gauge, with flat heads.

This package will provide for two cheeses 12 inches in height with 14½ inches diameter, each weighing approximately 80 to 85 lb.

Cheese should be packed with scale boards, to prevent them adhering to the timber, and the cheeses should not be too tightly packed, as they carry better with a little play.

A regulation is being issued under the Commerce (Trades Description) Act, 1905, providing that, in the case of cheese to be exported beyond the Commonwealth, the packages shall be made similar to the one here described.

CRATE FOR MEDIUM CHEESE.

For this class of cheese a package of similar make and strength to that used in the case of large cheese is recommended. The length of the crate will be different however.

(*a*) Where four 35–40 lb. cheeses are packed in the one crate, provision would have to be made for three centre boards, and room left to allow a little play to each cheese. This would necessitate having the battens a few inches longer than in the case containing two large cheeses.

(*b*) Where two medium-sized cheeses are packed, only one divisional board would be needed, and the length of the crate considerably shortened.

This small class of package is in request for Mesopotamia, in connection with the Imperial Army requirements.

In the full length crate (*a*), both ends and centre should be bound with 14-gauge galvanised wire. In the case of the smaller crate (*b*), it would suffice if the binding were put on both ends.

In all cases care should be exercised not to allow too much waste space between each cheese and the end and divisional boards—each cheese should have just sufficient room to move freely; on the other hand, they should not be too tightly packed.

Markings on Crates to be Exported beyond the Commonwealth.

It is most important that these markings be put on so that they may be clearly discerned.

In order to do this, a properly cut stencil is required, and printers' indelible ink should be used.

Under Regulation 12 of the Commerce (Trades Description) Act, 1905, it is provided that on each package shall be applied a true trade description, giving the following particulars :—

1. The name of the manufacturer or producer or exporter;
2. The registered brand of the manufacturer or producer or exporter.

The label or brand shall specify the nett weight or quantity of the goods; the State and country of origin to be also shown.

The Agent-General for New South Wales also advises that, for trade purposes and easy identification at port of arrival, the brand should be so placed that it will be an outstanding feature.

To comply with the foregoing conditions, it is recommended that the markings be put on as follows :—

On one end, in not less than ⅞-inch letters, the name of the manufacturer or exporter. For example :—

A.B.C. Coy., Ltd.
Exporters.
New South Wales.
Australia.

On the other end the name of the manufacturer could be shown, if so desired.

On the battens should be the following, placed so as to form one mark. The letters of the brand should be of at least 1½-inch size, as should also be the figures giving the nett weight.

Specimen :—

" SHORTHORN " Brand.
2 coloured cheeses—160 lb. nett.

Poultry Notes.

NOVEMBER.

JAMES HADLINGTON, Poultry Expert.

A GENERAL survey of the hatching season just brought to a close appears to indicate that a larger number of chickens than usual has been hatched. Most breeders appear to have more or less exceeded their usual output, and in addition the day-old chicken business seems to have been exceptionally brisk.

As far as the results are concerned, normal percentages appear to have been secured on the whole. True, many inquiries have been received in regard to infertility, "dead in the shell," and poor hatches generally, but these are troubles that are incidental to every hatching season, and that will, it is feared, continue to be always with us. Most of these are probably cases where operators are passing through failure, perhaps as one of the stepping-stones to ultimate success; in other words, they are cases where experience is being bought. Many inquiries, however, indicate that on the whole too much is expected, and that great disappointment is felt when only 50 per cent. to 70 per cent. hatches are secured. These inquiries come principally from beginners who have expected to secure 85 per cent. to 95 per cent. on the strength of the boasts of persons who happen to have secured extra good hatches on odd occasions. It is the experience of almost all poultry farmers hatching on a fairly large scale, that while they occasionally obtain such high percentages as those mentioned, they mostly fail to secure anything near them. They certainly do not make such averages over the season, the lower figure being nearer the mark. As a matter of fact, most large operators here and in America calculate their incubator capacity on the assumption of two eggs to a chicken. If these facts were more generally understood perhaps less disappointment would be experienced, although that should not make us content with low percentages.

By far the largest number of complaints in regard to poor hatches come from people who are endeavouring to hatch eggs with very small incubators of cheap construction. There is much conflict of evidence; but allowing for everything, it may be said at once that the failure of most small machines is due primarily to the fact that owing to the small body of heat, the regulation of temperature is difficult, and it is not to be expected that the same uniform results will be obtained as from incubators of larger capacity, say from 100 eggs upwards As a general rule, the smaller the incubator the more difficult it is to operate.

Another circumstance affecting the hatching percentages is the small number of fowls owned by many people who acquire incubators of a capacity so large that the eggs have to be kept too long before being set.

Yet another cause of failure lies in the unsuitable housing of incubators. It often happens that the incubator room is of a most make-shift description, and in consequence there is a great variation of temperature, especially between night and day. This variation has not only the effect of making the machines most difficult to operate, but it produces also a considerable variation in the amount of ventilation passing through the machine. During the day the high temperature results in a slow circulation of air through the machine, while during the cold hours of the night the circulation of air through the machine is considerably accelerated. Large machines with good regulating devices will often give fair results in a room where a small machine would fail utterly.

Brooding.

This is another operation that affords the widest contrasts in results achieved. One person is found rearing chickens more or less successfully under such conditions as baffle even expert knowledge. Perhaps the following year, with the very same brooding equipment, utter failure will result. Hence the tendency for poultrymen to rush to extremes. If one could only ascertain the exact cause of success or failure in either case, it would invariably be found that either some alteration has taken place in the procedure followed, or that the chickens were less robust than those of the good year, and thus less able to stand vicissitudes.

When the whole circumstances come to be known, it generally turns out that there has been some material alteration in manipulating the chickens or the working of the brooders, or that the number kept in the brooders at the different periods has not been the same, and that this alteration has made all the difference between success and failure. Perhaps the most common cause is that during the successful period of rearing the brooders have been rather under than over-stocked, while during the following season, or at some critical part of it, more chickens have been packed into the brooders than they are designed to accommodate.

Another source of trouble lies in the fact that brooders nominally accommodate a certain number of chickens, say 100, but the operator fails to grasp the fact that brooder capacity is mostly calculated on the size of the chicken for the first week, and that only about half that number should be in the same brooder at four or five weeks old. This is a very common error, and it is perpetrated year after year with the same results. It should be understood that a brooder should contain at least 8 square feet of floor space to accommodate 100 chickens for the first week, and afterwards the chicks must be thinned down as indicated.

Another factor in successful brooding is that the larger the number of chickens kept in one brooder compartment the more perfect the conditions need to be, and the greater the experience necessary to handling the chickens successfully.

Outbreak of Coccidiosis.

It will be remembered that last breeding season the attention of poultry-keepers was directed to the fact that among the numerous specimens of very young chickens submitted to the Department of Agriculture for pathological examination, three cases of coccidiosis were brought to light by the investigations of Dr. Dodd, of the Veterinary Science School, Sydney University, who undertook the microscopical examinations for the Department. So far as is known, these were the first cases of coccidiosis in poultry discovered in this State. Subsequently a large number of specimens were secured and submitted, but without further result. This season the trouble has again made its appearance, and already several cases have been diagnosed. Apparently the trouble is more wide-spread than has been hitherto suspected. Poultry-keepers will be well advised to be on the look-out for this trouble, with a view to its early diagnosis, so that the Department may be in a position to advise steps for its control. Briefly, coccidiosis is a disease produced by small forms of animal life, called *coccidia,* which are widely distributed in nature and frequently attack birds. They are particularly destructive to very young chickens and also to pigeons. Similar parasites also affect mammals, such as rabbits, rats, and mice. These organisms infest the digestive and intestinal tracts, and can only be seen by the microscope. They may exist to some extent in adult fowls and strong chickens without any great disturbance of the normal health, but in such cases these become carriers from one season to another, and the disease is liable to break out in epidemic form when favourable conditions exist for its development. The predisposing influences to an attack of acute coccidiosis are any conditions which tend to lower the vitality of the chicks.

It should, however, not be assumed in all cases where numbers of chickens are dying that it is necessarily as a result of this disease. There are no special symptoms, and the presence of coccidia can only be determined by microscopical examination.

In connection with the outbreak of this disease last year, poultry-keepers were advised in these notes that, owing to the fact that coccidia and other organisms could live in the soil for a considerable length of time, it was inadvisable to dig up poultry-yards, as that was a practice that would only result in protecting such organisms from the sun and air, which are necessary for their destruction.

It might be pointed out, too, that intensive methods of keeping poultry are likely to result in considerable trouble from this class of organism, the droppings being the most important distributing factor. Strong, well-developed stock have a better chance of resisting coccidia than weak stock. Chickens kept under conditions conducive to chills are almost certain to fall victims to acute coccidiosis where the organism happens to be present. No treatment appears to be of any use in the case of chickens of such tender age ; prevention is practically the only means by which we can hope to combat the disease. Ground that has become infected should be rested and exposed as much as possible to the sun. In addition to this, sprinkling the surface with lime after the ground has been cleared of chickens is suggested.

Agricultural Bureau of New South Wales.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

A meeting was held on 24th September, at which the rules for this newly-formed branch were drawn up. It was decided that in future meetings should be held monthly instead of fortnightly.

Bimbaya.

The monthly meeting of the Bimbaya branch was held on 6th September. The attendance was good, and included several new members.

Mr. A. J. Godfrey read a paper on bee culture, which is summarised below. Numerous questions followed, and much useful knowledge was gained, many of the younger members taking part in the discussion.

Mr. W. J. Robinson read a paper entitled "To Melbourne, *via* Albury," which proved very interesting and instructive.

BEE CULTURE.

The first bees introduced into this country were the common bees of Europe, usually designated "black" or "grey"; both names are appropriate, since the race varies in shade. Now we are familiar with the Italian bee, which is easily distinguished by the gold-coloured bands on the abdomen. It is very industrious, inclined to rob weak colonies, and very courageous and active against robbers. The great superiority of this kind of bee over any other known is now universally acknowledged, for it has successfully stood the test of practical beekeepers as against the common bee, and it is less sensitive to cold. The queens are more prolific than those of any other kind, being great defenders of their moral rights. Bee moths are hardly ever found in the combs of Italian bees. If correctly handled these bees very rarely sting, but if roused they become very defensive.

The sting of the bee (the horror to so many) is indispensable to her preservation. Without it, the attraction that honey presents to men and animals must, ere this, have caused the complete destruction of this precious insect. The sex of the inmates of the hive was for a long time a mystery, but we now know that there are three kinds, viz., drones, queens, and workers. The drones are the males, the queens are the perfectly developed females (the mothers), and the workers are undeveloped females.

The queen lays all the eggs, and deposits one in each cell. The egg hatches in three days into a footless larva with thirteen segments, inclusive of the head. This larva is fed with a milky substance specially prepared by the young bees. On the ninth day the cells are sealed over, and the young bees are left until they gnaw off the capping and come out perfect bees on the twenty-first day from the laying of the egg.

The Langstroth hive is the one which I would advise beginners to start with. The movable frame, when correctly used, gives perfect control of the contents of the hive. The frames should be spaced 1½ inches from centre to centre, which will give ½ inch between combs. Correct spacing is very essential. All frames should be hung perfectly plumb. The hive should be set close to the ground upon bricks. I consider bees thrive best where there is plenty of undisturbed forest and undergrowth. They gather a very superior honey from white clover. Where there are white box trees the bees gather what is considered one of the very best quality and flavoured honeys. Lucerne is another source of high-class honey.

I would strongly recommend a thoroughly co-operative spirit among beekeepers, particularly neighbours. They should come together as often as convenient and compare notes, and go through the hives in a practical manner. Many points of mutual interest would be the result.

DEPARTMENTAL NOTE.—The Apicultural Expert remarks that the distance between the surface of one comb and another should be ⅜-inch, and from the centre of one comb to the centre of the adjoining comb it should be 1⅜ inches—a little less in each case than is mentioned in the paper.

Buckaroo.

A meeting was held on 15th September, at which a comprehensive programme was drawn up for the meetings of the ensuing year.

On 29th September another meeting took place, at which Mr. J. D. Mason read a paper, entitled "How to grow a good crop of wheat."

Coraki.

A meeting was held on 11th September, when the business was restricted wholly to preparations for the Bureau exhibit at the forthcoming Coraki show.

Cotta Walla.

A meeting was held on 4th September, at which Mr. J. C. Weatherspoon read a paper on calf-rearing, from which the following paragraphs are taken:—

CALF-REARING.

Calves are a consideration to the dairyman at the present time, owing to the high prices that cattle are bringing. It pays the dairyman to rear as many as possible, therefore, and the better he rears them the more they will realise when marketed.

From my experience I have found the following plan the best:—I leave them with the cows until they are three days old, milking the cows out twice a day and leaving a little in one teat for the calf's next drink. On the afternoon of the third day I take the calf away from the cow and tie it up in a yard for the purpose. Next morning I offer him some milk. If he won't suck the finger, I open his mouth with the left hand and put some milk on the tongue with the right, and then release the hold with the left hand so that he can swallow the milk. He will then in nearly all cases suck the finger; if not, I give him more milk in the same way until he does suck the finger, after which there should not be much trouble in getting the average calf to drink.

I feed the calves three times a day until they start to eat, when I turn them out in a paddock separate from the cows, and feed them twice a day until they are about four months old. Then I revert to once a day for four to six weeks, by which time they are well reared. I always tie the calves up to feed them up till the time I turn them into the paddock.

Leaving the calf on the cow for three days gives the udder a good cleaning out, and also gives the calf a good start, the first milk being essential to the calf. It is surprising how a calf will fatten and grow in those three days, and I find they take to the bucket more readily than calves taken from the cows when only a few hours old.

DISCUSSION.—Members were unanimous in their opinion that the calf should be left with the cow for three days, for the cow's first milk was of no value except to give the calf a good start.

The commonest sickness in calves (blood-scouring) was discussed and many remedies stated, but one member who had tried most of them stated that the best and simplest remedy he knew was two tablespoons of starch dissolved in hot water and added to the milk on which the calf was fed.

DEPARTMENTAL NOTE.—The Herdmaster of the Department remarks that it is not the best practice during the first three days to leave a little milk in one of the teats. Immediately after milking the secretion of milk begins, so that it is not necessary. The practice may also make the cow slightly lop-sided, and it tends to cause affection of the udder. It is also rather soon after taking the calf from his mother to offer him milk next morning. He should be allowed to remain hungry until the following evening, when there will be less trouble in coaxing him to drink.

Holbrook.

Mr. Mathews, Sheep and Wool Expert, visited this branch on 3rd October, and conducted demonstrations in a number of local woolsheds.

DEMONSTRATION AND LECTURE ON SHEEP AND WOOL.

Mr. Mathews said his special mission was to deal with the question of the preparation of the wool for market. This had become very much more important in view of the scheme of appraisement which had been inaugurated by the Federal Government on behalf of the Imperial authorities.

The greater portion of last year's clip had already been handled by the Government, and it was generally agreed that the scheme had been carried out to the satisfaction of wool-growers generally. When the proclamation announcing the intention of the Government to take over the wool clip was first made known, it was wondered by all how a product like wool could be handled on a fair and equitable basis. A "flat rate" of 15d. per lb. was set as the basis of value at which the clip of the Commonwealth was acquired. This rate applied to all wool grown in the Commonwealth, irrespective of type, class, or quality.

With such wide disparities in value, the flat rate fixed required to be apportioned according to the value of different grades. This led to the creation of an executive committee, who drew up a schedule scale of prices to meet the requirements of the times. This information should be of infinite value to the grower, inasmuch as it indicated to him that these values were fixed for grades in even lines and not in mixed condition. If the wools were packed in the mixed condition, not only was the work of the appraiser rendered more difficult, but the farmer himself could not expect to rely on getting a fair value for the wools being appraised.

The large sheep-owner was not in the same sense affected by the present scheme as the small man, as he generally made provision to have his wools uniformly and properly graded by expert classers. It was the small sheep-owner who had been neglectful about the manner in which he marketed his wool, and who was likely to suffer by the present method unless he paid more attention to the classification.

It should be understood that the wool must be valued, whether mixed in grade or quality or otherwise.

Under the old order it was left to the option of the buyer whether he would bid for the wool when offered, and frequently small clips had been bought by dealers, reclassified, and re-offered in the same markets in big lines. This naturally resulted in a loss to the producer, as the dealer would require to make his profit from the resale of the wool. Farmers, therefore, should endeavour to have their wool graded into as even lines as the size of their flocks would permit. It should be further understood that under present arrangements the objection to having the clips classed into too many lots did not now exist to the same extent as in the past. Formerly buyers objected to small lots, for the reason that they took up as much time as big lots, and they had not the necessary time at their disposal. Under the schedule, however, the small breeder with a few bales of a certain class of wool might expect to receive the same value as one possessing many more bales.

Dealing with the question in its broader aspects, the expert recommended all Merino sheep being shorn separately, and the wool classified distinct from the crossbred wool, which classes of sheep comprised the majority of small flocks of the district.

In respect of Merinos he strongly advocated that all fleeces be properly skirted and the skirtings, which were termed "pieces," thoroughly trimmed and classed, according to the portion of the fleece from which they were taken.

Mr. Mathews emphasised the necessity of making a distinction between the different classes of Merino wool. In most Merino flocks there were coarse and fine grades. A distinction should be made on this basis, and farmers should establish sorts to separate the coarse from the finer grades of wool, according to the standard of fineness and coarseness in the flock. All coarse fleeces should be put in one line and fine fleeces in the other. This would enable a distinction also to be made for the amount of condition present in the wool. In the "pieces" there should be at least three lines. As considerable differences of value existed between "burry" wool and "free" wool, every endeavour should be made to make a distinction for classes so affected. This in a very great measure might be avoided by efficient skirting. Where the country was not badly affected by burr, it was only the lower portions, viz., the breech and hinder parts, that became infested. The skirtings should be regulated so as to remove the burry from the free portions of the fleece.

With regard to crossbred wool, a distinction in grade should be made according to the proportion of longwool or Merino represented in the cross. Where Lincoln rams had been used, at least four standards of grade, viz., "coarse," "medium," "fine," and "superfine," should be made. Where Border Leicester or the finer types of British longwools were employed, three grades would be, perhaps, sufficient, and these should consist of "medium," "fine," and "superfine." Care, however, should be exercised in the skirting of the wool, as in the case of the Merino.

Jilliby-Dooralong.

A branch of the Bureau has been formed in this district, with a satisfactory membership to commence.

A meeting was held on 6th October, at which the following officers were elected:--Chairman, Mr. W. Russell; Vice-Chairman, Mr. C. B. Smith; Treasurer, Mr. W. Smith; Hon. Secretary, Mr. K. A. Smith.

Mr. W. Smith read a paper on ploughing, and a number of questions were asked, a general discussion following.

The Secretary reports that residents of the district are very enthusiastic with regard to the work of the branch.

Kellyville.

A meeting was held on 6th October, at which a discussion took place on a disease now affecting apple trees in the district.

Lidcombe.

The annual meeting was held on 13th August, when the officers for the ensuing year were elected and the annual report was presented.

The report showed that the membership stood at fifty-six, and that twenty-four meetings had been held during the year. A spraying outfit had been purchased for the use of members at a small charge. The report also stated that monthly competitions had been running for some months for the production of flowers, vegetables and fruit, the exhibit throughout being of a good quality. The branch had purchased agricultural lime at wholesale rates, which was made available to members at the price paid by the committee.

A meeting was held on 10th September, when fifty-three members and visitors were present, sixteen new members being admitted. It was decided to organise a flower-stall in connection with War Chest Day. A lecture was delivered by Dr. Cleland on "Commonplace observations of our surroundings." The lecturer dealt with common weeds, flies, and insects, and showed an interesting number of exhibits.

Lower Portland.

A meeting was held on 3rd October, business being confined to arrangements in connection with the coming agricultural show. Mr. G. J. Mitchell exhibited samples of green Thew wheat, and stated that he had found the variety a good drought-resister. During the recent extremely dry season he had obtained a crop 3 and 4 feet in height in unmanured ground.

Miranda.

A meeting was held on 3rd September, which was attended by 112 members of the branch. A motion tabled by Mr. W. H. Paine, to the effect that 10,000 or more eggs be exported to the United States, was agreed to, and arrangements were made to carry it into effect.

A motion was also carried that the Prime Minister be petitioned to arrange for the export of 5,000,000 eggs to England.

At a meeting held on 10th September, which was attended by 102 members, Miss Preston Stanley gave a lecture on eugenics.

Some time ago it was mentioned that the work of the branch had been divided into three sections, namely, poultry, orchard and garden, and women's work. The latest report received from the Secretary states that the scheme is proving an admirable one.

The poultry section is doing excellent work in watching the industry and taking records of such matters as the egg-yield month by month, deaths in chickens, and comparisons of the temperature and rainfall.

The orchard and garden section has arranged exhibits of produce, and is now commencing a competition for the best-managed and most business-like garden in the Shire of Sutherland.

The ladies' section is doing war and educational work.

Owing to these recent extensions of the branch's activities, it has been found necessary to arrange for a building that will provide a meeting room and offices, and a company has been formed, which has secured a suitable block of land and a building. The membership of the branch is now 130, including forty-five ladies.

The following suggestions, taken from a paper by the Secretary of this branch, may be of interest to the secretaries and organisers of other branches:—

BRANCH ORGANISATION.

The organising officials of each branch should see that in advocating new methods local practice is not attacked, for the effect is often to produce prejudice. New methods should be advocated with care. A visit to a district or a farm on which the right thing is being done should be arranged, and out of such a practical demonstration will arise much discussion, with the result that presently the idea is partly adopted, and then in a year or two it will be in application in a greater degree than is realised. Then obtain a good lecturer to go the whole way with the proposal.

Whether it is urging something upon the member of Parliament for the district, or fighting a pest or anything else, the requirements should be carefully studied, and the case prepared in such a way as to command the support of the people. The organisation should be so bent on doing things well, that people will find it pleasanter to do the right thing than to be indifferent about it. The officers should study their district, and by leading members to take up issues that will give some quick results, they will prove the usefulness of the branch and will lead the members to fight for things that would otherwise not have been secured for years.

When getting lecturers to visit the branch, organise the meeting well, and notify the members by a printed or duplicated letter a few days before the event. The Secretary will find he is supposed to do the thinking for everybody, and that he will be more successful if his notices are enthusiastic and human. As to the lecturer, steps should be taken to see that he is acquainted with the special needs of the district; if he comes with a purely general lecture, more than half he says may be of little local value. Organisers should not expect the Department of Agriculture to supply all requirements in the way of lecturers. Many of the officers are fighting. Secretaries should look out men who are successful farmers and cultivators, and get papers from them. Encourage such lecturers to specialise, not generalise, and thus make the meetings touch questions of efficiency, economy, improved methods, improved stock and crops. Competitions, shows, libraries, &c., are other directions in which the branch can serve the district.

Narrandera.

A lecture was delivered on 29th September by Mr. H. C. Stening, Inspector of Agriculture, on diseases of wheat. Mr. Stening explained at length the various diseases to which wheat is liable and the treatment recommended by the Department, and at the conclusion of his lecture replied to numerous questions.

Parkesbourne.

The anniversary of this branch was celebrated on the date of the monthly meeting (26th September) by a social gathering and card tournament, in aid of the Comforts Fund for soldiers from the district. The Secretary reports that a very pleasant evening was spent.

Quaker's Hill.

A meeting of this newly inaugurated branch was held on 8th September, when Mr. James Pye gave a practical demonstration in the selection of cobs for seed maize, showing an extensive collection of various kinds.

Mr. A. Adams gave a brief talk on the cultivation of vegetables.

There being in the district a fair number of members with varied interests and desires, it was arranged that a general discussion should take place on some of these matters, and a meeting was held for the purpose on 6th October. A great variety of questions was asked and freely discussed.

Arrangements have been made for a visit to the orchard of Mr. Pye at an early date, and also for a paper by Mr. East on poultry-farming.

Spencer.

A meeting of this branch was held on 13th October, at which a discussion took place on the use of lime on the soils of the district.

Springside.

A meeting of this branch was held on 25th September, when Mr. Farrell read a paper on the preparation of the soil for a crop of potatoes.

Mr. G. Giles read a paper, from which the following paragraphs are taken :—

GENERAL ORCHARD WORK.

The selection of a site for suitability of soil and situation contributes in a great measure to success in orchard work. It is a waste of time, land, and hard cash to plant fruit trees on low, wet land, or where rock or ironstone are near the surface. An elevated site with depth, even on poor land, will produce well. An easterly or northerly slope is best, and if no natural break-wind exists one should be planted. In preparing for planting, plough as deep as possible. The depth must be according to nature of the subsoil. If it is loose and open the trees will do their own subsoiling, but if it is tight it needs to be well torn up. Mark the land out carefully, giving the trees ample space to grow : 20 feet is close enough, and 25 feet is not too wide. Select trees of the best varieties of each kind which have been proved a success in the locality. Get healthy trees and discard any culls that may be found in the bundles. Trees should be planted as deep as when in the nursery. All work should be faithfully done, as the planting of an orchard should be for a lifetime, and it pays to do it well. If planting on old soil, use a little commercial fertiliser to give the trees a good start. Cut off bruised roots, and spread the roots out evenly, with a good dip down. Cut the head of the tree well back ; the root system has been badly damaged, and should have a chance to recover, and cutting back gives the necessary relief. Keep the ground well worked during the spring and summer, and thus give them a good start, for if they do not get that it is better to pull them out and replant. Devote the first few years to shaping the trees. Cut them well back to develop strong main branches. I would advocate pulling off all fruit till the trees are six years old, for you cannot grow fruit and timber on young trees ; in other words, grow the tree first and get the benefit of the fruit afterwards.

In planting, give ample room (say, 10 yards) at the ends, or there will be trouble in turning the horses and implements when trees are full grown. Local trees can be obtained which equal any grown in the State. Plant apples, pears, cherries, and plums ; leave peaches alone, but if you will have a few leave the early ones alone. Do not neglect spraying, winter or summer, in order to cope with the pests. Avoid having too much fruit coming in at the one time. Get a rotation ; apples and pears as a rule will keep, but stone fruit must go when fit.

Pick, grade, and pack carefully. It pays to do so. When buyers find the fruit genuine, no trouble is experienced in finding a ready market. Good coloured fruit counts on the market. Black or red colours invariably beat other colours regardless of quality.

If fruit growing is taken up for a living, use plenty of elbow grease, and don't forget that hares, rabbits, and fruit trees cannot be raised on the same patch of land.

St. John's Park.

A meeting was held on 21st September, at which Mr. F. Hawkins lectured on pig-raising.

Tennyson (North Richmond).

A meeting of this branch was held on 1st September, which was attended by forty-five members. Mr. H. A. Wood, Fruit Inspector, gave an address on citrus fruit culture in the district, grouping his remarks under ten headings. The following is a summary of his address :—

CITRUS FRUIT CULTURE.

Local conditions have a great deal to do with success in growing citrus fruits. In districts such as Moss Vale and Orange we have most suitable soil, but the climate and local conditions are too cold. The best position is one with a north-east slope, well out of reach of heavy frosts, but it must be fairly close to a good market. Unless there is a natural wind-break, such as a hill on the windy side or a natural forest, some kind of wind-break is necessary to prevent the fruit and trees from being battered and bruised in rough weather. The best break-wind is a double row of *Pinus insignis* trees.

A fruit tree should have a strong barrel with a good root system, and when planted the first limb should leave the barrel about knee high. The union of the scion and stock should be level with the ground.

Intense cultivation should be carried out where practicable, but if this was practised in the majority of orchards in the Kurrajong district half the soil would be in the creeks and gullies after a heavy thunderstorm. The best manure for trees is from the farmyard ; but as it is not always obtainable in sufficient quantities, other means have to be resorted to. The growing of cover crops, such as cowpeas, rape and barley, or allowing weeds to grow in the autumn to be ploughed under during the winter, all help to keep the ground manured. Artificial manure should be applied in two dressings, the first in June to help mature the fruit then on the tree and to set a good bloom in the coming spring, and the second in December to put the tree in good heart for the autumn growth.

Trees of the citrus family should be pruned from the time of planting, so as to get a good shape, but when matured they need but little pruning other than keeping the inside cleaned out and removing dead limbs The Thorny mandarin is an exception ; to get good results from this tree it is necessary to prune each year, the centre being kept clean and the outside wall (which becomes very thick) thinned out. Lemons should be kept from growing too high. The tree should be kept cut back, and made to grow thick inside With this method the lemons will always keep white, and will command a better price than rusty ones.

It seems strange that an orchardist should labour all the year round to get his crop, and when it is ready for market should have it spoilt by different pests, but it often happens. It should be not so when we have so many methods of fighting these pests, such as fumigation and the different oil compounds. The main secret is to act before the pests go so far as to weaken the tree.

Lastly, too much care cannot be taken with the grading and packing of the fruit. In some cases it appears as though the fruit was pulled with a rake and the lid jumped on to tie the case. That is not the way to get the best prices.

Toronto.

A meeting was held on 14th August, at which a discussion took place on potato culture. At a meeting held on 11th September several members took part in a debate on the cultivation of cucurbits.

Valla.

A meeting was held on 3rd September, when it was decided to revive the work of this branch. A considerable number of local farmers have expressed their interest in the work, and appearances indicate that the branch will now become a very progressive one.

Woonona.

The annual meeting was held on 11th September, and after the annual report had been read, and the election of officers had taken place, Mr. George Gilchrist read a paper on sweet pea culture, describing also the methods of hybridisation.

Yurrunga and Avoca.

At the September meeting, Mr. Geo. Ragg gave an address on the most suitable winter fodder crops for the district, giving an account of the methods of cultivation in each case.

LIST OF BRANCHES.

Branch.	Hon. Sec.
Albury	J. Brann, Racecourse Rd., Albury.
Baan Baa	P. Gilbert, Baan Baa.
Balldale	H. Elrington, Balldale.
Bankstown	J. W. Cunningham, Brancourt avenue, Bankstown.
Bathurst	J. McIntyre, Orton Park.
Batlow	A. C. Arnot, Batlow.
Beckom	H. Horsburg, Beckom.
Bimbaya	J. R. Boller, Tantawanglo.
Blacktown	R. H. Lalor, P.O., Seven Hills.
Bloom Hill (O'Connell).	C. A. McAlister, Bloom Hill, O'Connell.
Borambil	H. A. D. Crossman, "Homewood," Quirindi.
Braidwood	A. Page, Braidwood.
Brocklesby	J. Hunter, Brocklesby.
Buckaroo	P. J. Crowley, Buckaroo.
Bungalong	G. H. Pereira, Grenfell Rd., via Cowra.
Canadian	F W. Taylor, Canadian Lead.
Cardiff	John Cockburn, Cardiff.
Carlingford	F. H. Harvey, Ray Road, Epping.
Cattai	A. J. McDonald, Cattai, Pitt Town.
Clovass	W. G. Cox, Tatham.
Cobbora	Robert Thomson, Cobbora.
Collie	C. J. Rowcliff, Cow Plain, Collie.
Comboyne	J. J. Dolton, Comboyne.
Coobang	H. E. Drabsch, "Wimmera," Parkes.
Coonabarabran	H. H. Moss, Coonabarabran.
Coradgery	M. J. Kelk, Black Trundle Road, Parkes.
Coraki	G. A. Forrest, Coraki.
Cordeaux-Goondarin.	G. H. Walker, Upper Crown street, Wollongong.
Coreen-Burraja	—
Corowa	R. Dwyer, Corowa.
Cotta Walla	T. A. Howard, Cotta Walla, Crookwell.
Crudine	F. W. Clarke, Crudine.
Cumnock	K. J. Abernethy, Cumnock.
Cundletown	S. A. Levick, Roseneath, Cundletown.
Cundumbul and Eurimbla	J. D. Berney, Eurimbla, via Cumnock.
Cunningham	B. J. Stocks, Linden Hills, P.O., Cunningham.
Deniliquin	W. J. Adams, jun., Deniliquin.
Dubbo	T. A. Nicholas, Dubbo.
Dunedoo	Geo. Turvey, Dunedoo.
Dural	H. E. Wickham, Dural.
Erudgere	Frank Hughes, Erudgere.
Fairfield	H. P. Godfrey, Hamilton Rd., Fairfield West.
Fernbrook	W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	W. Thompson, Forest Creek, Frogmore.
French's Forest	J. W. West, French's Forest.
Garra & Pinecliff	S. W. Packham, "Clifton," Pinecliff.
Gerringong	J. Miller, Warrabank, Toolijooa.
Glenorie	J. Hutchinson, Cattai Rd., Glenorie.
Grenfell	A. A. Patterson (*pro tem.*), Grenfell
Gunning	E. H. Turner, Gunning.
Hay	F. Headon, Booligal Rd., Hay.
Henty	L. Eulenstein, Henty.
Hillston	M. Knechtli, Hillston.
Holbrook	Frank F. Forster, Holbrook.
Inverell	W. A. Kook, Rock Mount, Inverell.
Jerrara	A. O. Lane, Mullengrove, Wheeo.
Jilliby-Dooralong	K. A. Smith, Jilliby, Wyong.
Jindabyne	Sylvester Kennedy, Jindabyne.
Keepit (Manilla)	J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Daniel Kearney, Kellyville.
Lankey's Creek (Jingellic).	[Suspended.]
Leech's Gully	James Donnelly, Leech's Gully.
Leeton	W. J. Monfries, Farm 521, Leeton.
Lidcombe	A. E. J. Anderson, B.A., Platform-street, Lidcombe.
Little Plain	F. S. Stening, Little Plain, via Inverell.
Lower Portland	W. C. Gambrill, Lower Portland.
Mangrove Mountain.	A. E. Lillicrap, Mangrove Mountain, via Gosford.
Martin's Creek	P. Laney, Martin's Creek, via Paterson.
Matcham	W. R. Crossland, Matcham, via Gosford.
Meadow Flat	T. L Williams, Meadow Flat, via Rydal.
Middle Dural	A. F Best, "Elliceleigh," Dural.
Milbrulong	F. W. Gollasch (*pro tem.*), Milbrulong.
Miller's Forest	A. J. O'Brien, Miller's Forest.
Miranda	W. H. Paine, Miranda.
Mittagong	H. F. Thresher, Mittagong.
Moruya	P. Flynn, Moruya.
Narellan	G. J. Richardson, Narellan.
Narrandera	James Faulkner, Narrandera.
Nelson's Plains	M. Cunningham, Nelson's Plains.
Nimbin	J. T. Hutchinson, Nimbin.
Orangeville	C. Duck, Orangeville, The Oaks.
Orchard Hills (Penrith).	K. Basedow, Orchard Hills, via Penrith.
Parkesbourne	S. W. McAlister, Parkesbourne.
Peak Hill	A. B. Pettigrew, Peak Hill.
Penrose-Kareela	C. P. James, Penrose.
Ponto	A. D. Dunkley, Ponto.
Pyangle (Lue)	E. Miskle, P.O., Lue.
Quaker's Hill	C. Gardner, Blacktown.
Rawsonville	G. R. J. Hovenden, Rawsonville.
Redbank	J. J. Cunningham, Redbank, Laggan.
Ringwood	Wm. Tait, Ringwood.
Robert's Creek	J. W. Morrissey, Robert's Creek.
St. Marys	W. Morris, Queen-st., St. Marys.
Sackville	Arthur Manning, Sackville.
Sherwood	J. E. Davis, Sherwood.
Speedwell (W. Wyalong).	B. Noonan, Speedwell, Wyalong W.
Spencer	H J. Woodbury, Spencer.
Springside (via Orange).	E. H. Selwood, Springside.
Stockinbingal	J. Neville, Stockinbingal.
St. John's Park	J. C. Scott, St. John's Park.
Tallawang	Selwyn E. Hinder, Tallawang.
Tallong	W. Snushall, Tallong.
Tangmangaroo	A. Thompson, Kangiara Mines.
Taralga	Dave Mullaney, Stonequarry, Taralga.
Tatham	J. J. Riley, Tatham.
Temora	J. T. Warren, "Chacewater," Chellington, Temora.
Tennyson (North Richmond).	J. E. Sweet, North Richmond.
Thyra-Bunaloo	C. H. M. Smith (*pro tem.*), Thyra, via Moama.
Tingha	J. T. Robilliard, Tingha.
Toronto	J. Froome, Knowle Farm, Toronto,
Ulan	P.S.D. Howarth, Ulan, near Mudgee.
United Peel Riv. (Woolomin).	C. J. MacRae, Woolomin.
Upper Belmore River.	M. H. Hodgson, Upper Belmore River, via Gladstone, Macleay River.
Valla	A. E. T. Reynolds, Valla, via Bowraville.
Wagga	E. Crouch, "Estella," Wagga.
Walla Walla	H. Smith, Walla Walla.
Wallendbeen	W. J. Cartright, Wallendbeen.
Walli	C. T. Allen, Walli.
Warner's Bay and District.	J. Raw, Fairfax-st., Spiers' Point.
Wetherill Park	A. J. Hedges, Wetherill Park.
Wollun	J. B. Anderson. Wollun.
Wolseley Park	J G. Downie, Wolseley Park.
Woonona	W. H. Moss, Campbell-st., Woonona.
Wyan	—
Wyong	Edgar J. Johns, Wyong
Yarramalong	L. Hodges, "Greylands," Yarramalong.
Yetholme	N. D. Graham, Yetholme.
Yurrunga and Avoca.	R. Waples, Yurrunga.

Orchard Notes.

NOVEMBER.

W. J. ALLEN.

Cultivation.

As soon as the ground is dry enough after each rain or irrigation, orchards and vineyards should receive a thorough cultivation to a depth of 4 or 5 inches. This prevents rapid loss of soil moisture by either direct evaporation or through weed growth. This is important at this season of the year, especially if a dry spell should set in, for the trees and young fruit are now making rapid growth, and a plentiful supply of moisture is necessary to their welfare. Those parts near the trees not reached by the cultivator should be kept well worked up with a pronged hoe.

Fruit Fly.

In districts where fruit fly is likely to be troublesome, care should be taken to pick up and burn or boil all fallen fruit, and shortly before the fly usually makes its appearance kerosene traps should be set.

Codlin Moth.

With this pest also it is important to keep fallen apples and pears picked up and destroyed, and where it has been bad in former years the trees should be bandaged and examined at regular intervals. The second spray with arsenate of lead should be applied between four and six weeks after the petals have fallen.

Fungus Diseases.

If the weather has been wet, and apples and pears show any sign of Black Spot, either lime-sulphur or Bordeaux mixture (summer strength in each case) should be combined with the arsenate of lead spray.

As soon as the fruit is set, grape vines also can be sprayed again with Bordeaux mixture (summer strength) for Black Spot, or dusted with dry flowers of sulphur for oidium.

Summer Thinning.

Young trees should be examined again this month, removing some of the leaders and laterals where they are clustered too thickly, and pinching back the points of any leaders that are growing too strong at the expense of the others. The same practice may be carried out on older trees that are making a vigorous and too dense growth. Thinning out the growth in such cases allows more light to diffuse through the tree, and a better class of fruiting wood to form on the lower parts of the branches.

Grape vines should also be disbudded by brushing off superfluous shoots. When doing this work care should be taken to leave shoots near the base of old spurs or arms that have become too long. Such shoots will form a cane that can be cut back to a couple of eyes next winter, and in the winter following the old long spur can be cut away, leaving the new one in better position. Suckers coming from either trees or vines should be removed, otherwise they will absorb some of the vigour that should be going to the tree or vine.

Thinning Fruit.

When the final sheddings of young fruit take place as the stones commence to harden in the different varieties, the trees should be examined and the fruit thinned where it still remains too thick. With the threatened glut of fruit in view, thinning should be carried out more rigorously this season, the aim being to have as high quality fruit as possible.

Harvesting.

The early cherries will be coming in this month. The larger ones should be packed in quarter-cases, and the top should be faced to give a good appearance. In facing, care should be taken to face only with fruit which will fairly represent the average of the fruit underneath.

Early apricots and peaches in our coastal districts will also be ready for picking. Apricots and peaches ripen quickly, and these fruits should be picked on the hard side, as usually it is a few days after they leave the orchard before they reach the consumer, by which time they should be in a fit condition for use.

In some districts there are still some oranges and lemons to be picked.

Grafts and Buds.

These will require regular attention; shoots coming from below the graft or bud should be removed as they appear.

Pruning.

Pruning of citrus trees may still be continued. Passion vines may be cut back where a winter crop is desired, and should receive a dressing of a fertiliser.

QUALITY OF NEW SOUTH WALES MALTING BARLEY.

REFERENCE has been made in previous issues to the desirability of our farmers growing at least sufficient malting barley to supply local requirements. In this connection it is of interest to note that, according to the testimony of one of the leading brewers, New South Wales barley can compete on level terms with imported samples. While, largely owing to the very wet weather experienced at harvesting time, the bulk of this cereal grown in the State did not compare favourably with what was purchased by the Company in South Australia and Victoria, undoubtedly the finest malt of the season seen by the officers of that particular concern was made from a line of barley grown at Mount Pleasant, Wagga Wagga, by Mr. P. F. Maher.

The analyst's report shows that as a result of sixty-two analyses made in the laboratory of this season's malt (comprising malts received from all the maltsters supplying the Company, as well as malts made at Mittagong from Chilean, South Australian, and Victorian barley), he was of opinion that the malt made from the barley grown by Mr. Maher had undoubtedly shown by far the best results. Mr. Maher's barley was awarded the first prize at the 1917 Royal Agricultural Show for Chevalier type (two-row), and the malt analysis results confirm the accuracy of the judge who made the award, as well as reflecting the greatest credit upon the grower who produced the barley in a difficult season.

This satisfactory result should be an encouragement to others to give this crop much more attention than it at present receives. There is no reason why the State should not produce all the malting barley it requires.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	H. G. Fraser	Jan. 30, 31
Berry Agricultural Association	A. McConaghy	Feb. 6, 7
Dapto A. and H. Society	J. J. Cook	„ 20, 21
Guyra P., A., and H. Association	P. N. Stevenson	„ 20, 21
Alstonville A. Society	C. D. McIntyre	„ 26, 27
Yanco Irrigation Area A. Society	F. E. Harrison	„ 26, 27
Bangalow A. and I. Society	W. H. Reading	„ 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	„ 26, 27, 28
Moruya A. and P. Society	H. P. Jeffery	„ 27, 28
Dorrigo and Guy Fawkes A. Association	R. R. Blair	„ 27, 28
Gunning P., A., and I. Society	S. A. Beer	„ 27, 28
Inverell P. and A. Association	J. T. Dale	„ 27, 28; March 1
Newcastle A., H., and I. Association	E. J. Dann	„ 27, 28; March 1, 2
Tenterfield P., A., and H. Society	R. G. White	Mar. 5, 6, 7
Tamworth P. and A. Association	J. R. Wood	„ 5, 6, 7
Braidwood P., A., and H. Association	L. Chapman	„ 6, 7
Tumut A. and P. Association	T. E. Wilkinson	„ 6, 7
Bellinger River A. Association	J. F. Reynolds	„ 6, 7
Berrima District A., H., and I. Society (Moss Vale)	C. E. Wynne	„ 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy	„ 7, 8
Queanbeyan P. and A. Association	J. G. Harris	„ 12, 13
Glen Innes & Central New England P. & A. Assocn.	G. A. Priest	„ 12, 13, 14
Cobargo A., P., and H. Society	T. F. Kennelly	„ 13, 14
Bombala Exhibition Society	P. J. Jonas	„ 13, 14
Tumbarumba and Upper Murray P. and A. Society	W. R. Figures	„ 13, 14
Camden A., H., and I. Society	A. E. Baldock	„ 13, 14, 15
Goulburn A., P., and H. Society	H. C. Fraser	„ 14, 15, 16
Armidale and New England P., A., and H. Assocn.	A. H. McArthur	„ 19, 20, 21, 22
Cooma P. and A. Association	C. J. Walmsley	„ 20, 21
Gundagai P. and A. Society	C. D. Asprey	„ 20, 21
Macleay A., H., and I. Association (Kempsey)	E. Weeks	„ 20, 21, 22
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	„ 20, 21, 22
Delegate P. and A. Society	F. H. Mullane	„ 21
Walcha P. and A. Association	S. Hargrave	„ 27, 28
Bathurst A., H., and P. Association	S. V. Turrell	April 10, 11, 12
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	„ 10-13
Upper Manning A. and H. Association (Wingham)	D. Stewart	„ 17, 18
Batlow Agricultural Society	C. S. Gregory	„ 23, 24
Dungog A. and H. Association	W. H. Green	„ 24, 25
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 27, 28, 29
Forbes P., A., and H. Association	J. H. Bates	Sept. 3, 4
Temora P., A., H., and I. Association	A. D. Ness	„ 17, 18, 19

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VOL. XXVIII. PART 12. DECEMBER 3, 1917.

Agricultural Gazette of New South Wales.

Water on the Farm.

[Continued from page 766.]

F. B. GUTHRIE.

Ponds and Lakes.

THE water of ponds and lakes is even more variable in composition than that of springs and wells or running water. The nature of pond-water will vary with the nature of the soil in which the ponds are situated, the rainfall, drainage and evaporation, and the extent of vegetable contamination to which they are subjected. The term lake is used somewhat indefinitely for large ponds or isolated bodies of water. It is also used to denote the broadening of a river, and even for bodies of water lying along the coast and in direct communication with the sea.

The water of mountain lakes is usually pure, and in some cases is used without purification for the water-supply of cities. For example, the Glasgow water-supply is derived from Loch Katrine, in the Highlands, 364 feet above sea-level, the water of which contains 3·8 parts per 100,000 of total solid residue, which is lower than in some of the samples of local rain-water quoted previously. On the other hand, the water of lakes such as the Dead Sea and the Elton Lake, which have been previously quoted, contain from 22,000 to 27,000 parts per 100,000 solid residue.

Again, some lakes are practically swamps, and contain large quantities of organic matter. The water of Drummond Lake (Dismal Swamp), in Virginia, contains 29·4 parts per 100,000 residue left on evaporation, of which no less than 25·8 parts consist of organic matter. The question whether such organic matter renders a water unfit for human consumption depends upon the nature of the organic matter. Many peaty waters are not only freely consumed but are considered to possess curative properties, particularly in the case of rheumatism and skin diseases. This question will be more fully discussed later. They are nearly always excellent waters for irrigating.

Artesian Water.

The term "artesian" is used rather loosely by geologists to describe either any deep well or wells in which water rises but does not overflow or wells in which the water overflows (flowing wells), rising under pressure often to a considerable height above the surface. Consequently, in all cases when artesian water is discussed it is important that the term should be defined. A good discussion of these different definitions is given in "Underground Water Papers, 1906," by Myron C. Fuller, Geologist-in-charge, United States Geological Survey, which will be found useful to those interested in this question.

For the purpose of the present notes, the definition adopted by Mr. E. F. Pittman, late Government Geologist for New South Wales, will be followed, as these notes will deal exclusively with water obtained from local bores. Mr. Pittman defines an artesian bore as one in which water is subject to a pressure sufficient to force it above the surface of the ground (in other words, a flowing bore). The term sub-artesian is applied to water which is under a pressure which causes it to rise some distance in the bore, but which is not sufficient to force it above the surface.

Owing to diminution of pressure an artesian bore may become a sub-artesian bore.

Origin of Artesian Water.

The Australian artesian water-bearing basin is a geological basin extending nearly 1,500 miles north and south, and nearly 1,000 miles (maximum width) east and west. The floor of this basin is composed of impervious rock. Above this impervious rock rest beds, of considerable thickness, of porous sandstone with interbedded shales. Above this porous layer again is an impervious layer of shales, limestones and clays, which has a maximum thickness of about 5,000 feet.

The porous sandstone outcrops at the surface along the eastern margin of the basin, on the western flank of the Great Dividing Range, where it reaches an altitude of 2,000 feet above sea-level. The width of this outcrop is about 65 miles, and it dips in a westerly direction towards the centre of the basin. The altitude of the area where the porous beds outcrop is everywhere considerably greater than that of the basin where the water rises in the bores. It is this porous sandstone, lying between the two impervious strata, that receives and holds the water which rises to the surface under pressure when the upper layer is pierced by boring. The exposed porous sandstones form a considerable portion of the catchment area of the Darling and its tributaries, and on the area where this porous sandstone outcrops the average annual rainfall is about 25 inches.

The water then which falls on, or flows over, this sandstone is absorbed by it and saturates it like a sponge, being imprisoned by the impervious layers below and above. When the upper layer is pierced the water rises to the surface under its own pressure, often to a considerable height. An artesian bore is consequently an artificially constructed spring. In the case of springs the water, as we have seen, issues through the impervious strata through naturally occurring fissures and crevices. The mud springs which are frequently observed are formed by artesian water which has slowly permeated the crevices in the upper layer under hydraulic pressure and has emerged at the surface generally mixed with mud and earth, which is deposited in mounds on the surface.

The artesian area in New South Wales covers about 83,000 square miles, and bores have been put down to a depth of up to 4,000 feet, giving flows as high as 4,000,000 gallons daily, with temperatures varying up to 148° Fahr.

Nature of Artesian Water.

The outstanding characteristic of the artesian water supply is the high proportion of saline matter it contains, particularly of carbonate of soda (alkali) and sodium chloride (common salt). Other salts are present, but invariably in much smaller quantities, and the distinctive characteristics of these waters are due to the two salts mentioned. The nature and amount of these ingredients will be more fully discussed later, when its suitability for irrigation and watering stock is discussed.

Impurities in Water.

From the preceding short sketch of the origin of the different kinds of water met with in nature, it will be seen that the impurities consist of saline and organic matter dissolved in the water.

These impurities may be classified as follows:—

1. Saline matters.—Salts of lime, magnesia, iron, alumina, soda, potash and ammonia in the form of carbonates, bicarbonates, sulphates, sulphides, chlorides, nitrates and nitrites principally.
2. Organic matter.—Due to vegetable and even animal contamination, and micro-organisms.
3. Gases—such as ammonia and carbonic acid in rain-water, carbonic acid under pressure in the case of some spring-waters, and acid vapours in the neighbourhood of towns or smelting works.

Mineral or medicinal waters contain one or other of the saline ingredients mentioned in (1) in quantities large enough to impart medicinal properties to the water. Amongst these may be mentioned chalybeate waters, which contain carbonate of iron; hepatic waters containing sulphides; aperient waters containing sulphate of magnesia; alkaline waters containing carbonate of soda, as in the artesian bore-waters. They also, sometimes, contain small quantities of substance such as salts of lithia, which are reputed to have a medicinal effect.

Peaty waters are contaminated with organic matter, and organic matter and bacteria are especially liable to occur in the water of shallow wells, notably such as are in proximity to human habitations.

In the case of deep wells, the soil acts as a filtering medium, and such organic contamination is less likely to occur.

Hard Waters.

In the course of this article the term hard water, as distinguished from soft water, will be frequently used, and it is necessary to define what is meant by this term and to what hardness of water is due.

By soft water is meant water, such as rain-water, which contains little or no saline matter in solution, and which forms an abundant lather with soap. By hard water is meant a water which gives no lather with soap. Hard waters also deposit a more or less closely adherent scale when used in boilers.

The term hard water is often used for a water which contains more than a certain quantity of saline matter, regardless of its nature and its action on soap. In these notes the term will be confined to such waters as contain salts of lime and magnesia.

The cause of the hardness is the presence of salts of lime and magnesia, particularly calcium carbonate and calcium sulphate.

Calcium carbonate, or chalk, is only very slightly soluble in water, but it readily dissolves in water charged with carbonic acid, forming a substance known as bicarbonate of lime, which is soluble in water.

Water which is hard, owing to the presence of bicarbonate of lime, can be softened readily either by boiling or by the addition of lime, and such hardness is known as "temporary" hardness, as distinguished from the hardness due to calcium sulphate, which cannot be removed in this way, and which is known as "permanent" hardness.

The following explanation may enable the process of softening such temporarily hard water to be understood.

Carbonate of lime, or calcicum carbonate, is a compound of lime and carbonic acid. When this substance dissolves in water containing carbonic acid, an additional molecule of carbonic acid is taken up. What happens may be written as follows :—

$$\underbrace{\text{Lime} + \text{Carbonic acid}}_{\substack{\text{Carbonate of lime}\\ \text{(insoluble in water).}}} + \underbrace{\text{Carbonic acid}} = \underbrace{\text{Lime} + \left\{\begin{matrix}\text{Carbonic acid.}\\ \text{Carbonic acid.}\end{matrix}\right.}_{\substack{\text{Bicarbonate of lime}\\ \text{(soluble in water, causing}\\ \text{temporary hardness).}}}$$

On heating this solution of bicarbonate of lime (hard water) the second molecule of carbonic acid is driven off, and the substance is converted into carbonate of lime, which, being insoluble in water, separates out as a precipitate, leaving the water free from carbonate of lime, and converting it into a soft water, thus :—

$$\underbrace{\text{Lime} + \left\{\begin{matrix}\text{Carbonic acid}\\ \text{Carbonic acid}\end{matrix}\right.}_{\substack{\text{Bicarbonate of lime}\\ \text{(hard water).}}} \text{(on heating)} = \underbrace{\text{Carbonic acid}}_{\text{driven off as gas.}} + \underbrace{\text{Lime} + \text{Carbonic acid}}_{\substack{\text{Carbonate of lime}\\ \text{(insoluble in water)}\\ \text{precipitates out.}}}$$

In the same way the apparently paradoxical action of lime in softening water which is hard, owing to the presence of lime, can be explained :—

$$\underbrace{\text{Lime} + \left\{\begin{matrix}\text{Carbonic acid}\\ \text{Carbonic acid}\end{matrix}\right.}_{\substack{\text{Bicarbonate of lime}\\ \text{(hard water).}}} + \text{Lime} = \underbrace{\left\{\begin{matrix}\text{Lime} + \text{carbonic acid.}\\ \text{Lime} + \text{carbonic acid.}\end{matrix}\right.}_{\substack{\text{Two molecules of}\\ \text{carbonate of lime}\\ \text{(insoluble in water)}\\ \text{precipitates out.}}}$$

In both cases the excess of carbonic acid which holds the lime in solution is removed; in the first case by driving it off by heat, and in the second by combining it with lime, the result in both cases being the formation of an insoluble carbonate of lime which precipitates out, leaving the water free from lime salts, and soft.

The water-supply of many towns which is derived from hard water is softened, on a large scale, by the addition of lime to the reservoirs. This is known as "Clark's" process, and will be dealt with more fully later. Hard water which has to be used as boiler-feed, is similarly treated with lime or can be softened by preliminary boiling, as explained by the first of the above reactions.

In the case of permanent hardness, which is due to calcium sulphate (gypsum), magnesium sulphate or calcium and magnesium chlorides, such hardness cannot be removed by the above methods. In the case of calcium sulphate, it is true that if present in any quantity it can be precipitated out on boiling, but this is due to the fact that calcium sulphate is less soluble in hot water than in cold and, when the water cools, the gypsum goes into solution again. It is this property possessed by both calcium sulphate and calcium carbonate of precipitating out on boiling that make them so objectionable for boiler-feed, as the precipitated salts form a more or less closely adherent scale on the boiler, which is difficult to remove.

(To be continued.)

COST OF PRODUCING A GALLON OF MILK IN CALIFORNIA.

THE following summary of the itemised data from five leading dairymen has been published in the annual report of the State Market Director of California. It is evident that while the final landed costs are fairly close in the five cases, there is a wide variation under the different headings, and the methods of allocating charges are possibly different. For convenience of reference, cents have been converted into pence.

		Dairy.				
		No. 1.	No. 2.	No 3.	No. 4.	No. 5.
Number of cows		300	150	150	81	170
Gallons produced		233,145	80,300	102,000	54,049	69,893
Gallons per cow		777	535	680	667	411
Cost of feed per gallon	d.	3·77	2·67	4·62	4·02	1·03
Cost of labour, &c.	d.	2·08	3·33	1·76	3·93	3·60
Overhead charges...	d.	·63	1·70	2·01	1·89	2·52
Miscellaneous	d.	1·00	·68	·15	·42	1·80
Total gross cost	d.	7·48	8·38	8·54	9·96	8·95
Value of by-products	d.	·38	1·32	·76	2·61	1·12
Net farm cost	d.	7·10	7·06	7·78	7·35	7·83
Transportation to San Francisco	d.	1·10	·52	·50	·75	1·15
Total cost f.o.b. San Francisco	d.	8·2	7·58	8·28	8·10	9·98

The inquiry was conducted to ascertain what was a fair wholesale price for milk, but it has a lesson of quite a different character. The dairy with the lowest average yield found that it took 23 per cent., or about 1¾d. per gallon, more to land its milk in San Francisco than the average of the others, while its outlay on feed was less than a third that of the average of the remainder.

Popular Descriptions of Grasses.

[Continued from page 772.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

THE BROME GRASSES—(*continued*).

Useful Varieties.

IN the preceding issue the useless Brome grasses were dealt with. There are some Brome grasses, however, which are extremely useful, and cultivated largely in America, Europe, South Africa, New Zealand, and to a small extent in Australia. Amongst these are the well known Prairie grass (*Bromus unioloides*) and the less known Awnless Brome grass (*Bromus inermis*).

PRAIRIE GRASS (*Bromus unioloides*).

This is an annual introduced grass, very common throughout the greater part of the State. It is a familiar sight on the coast, tablelands, and Riverina districts during the winter and spring months. In Sydney and other large towns it is common in badly-kept lawns, particularly so when they are shaded for a large portion of the day.

The seed-head of the grass is very characteristic, consisting of a number of overlapping sharp-pointed spikelets, the whole head ranging from ½ to 1 inch long. The leaves are large, wide, and succulent, and covered with a greater or less quantity of soft spreading hairs.

Prairie grass is largely used as a constituent of English grass mixtures on the coast and tablelands. It probably reaches its best development in the loose soils of New England, whence show sheaves have been obtained reaching a height of 8 feet. The other extreme to this is found on hard, dry granite and clay soils, where plants have been found 2 or 3 inches high, consisting of two leaves and one inch of seed-head. Its average height, however, on the coast is from 2 to 4 feet.

Prairie grass is considered one of the best dairying grasses in the State, both from a palatable and a milk-producing point of view. It grows spontaneously in many pastures, and it is only necessary to allow it to seed once during the year to enable it to come again the following season. In this connection it is interesting to note that Prairie grass will endure and thrive under grazing and mowing. In lawns particularly it develops stooling habits, under the treatment of the mower, that render it eventually difficult to remove.

The seed of Prairie grass germinates very readily, but should not be covered too deeply. It is best sown in the autumn. If sown only with clover, use 20 lb. of Prairie and 10 lb. of clover; if sown in a mixture, use about 12 lb. of seed per acre.

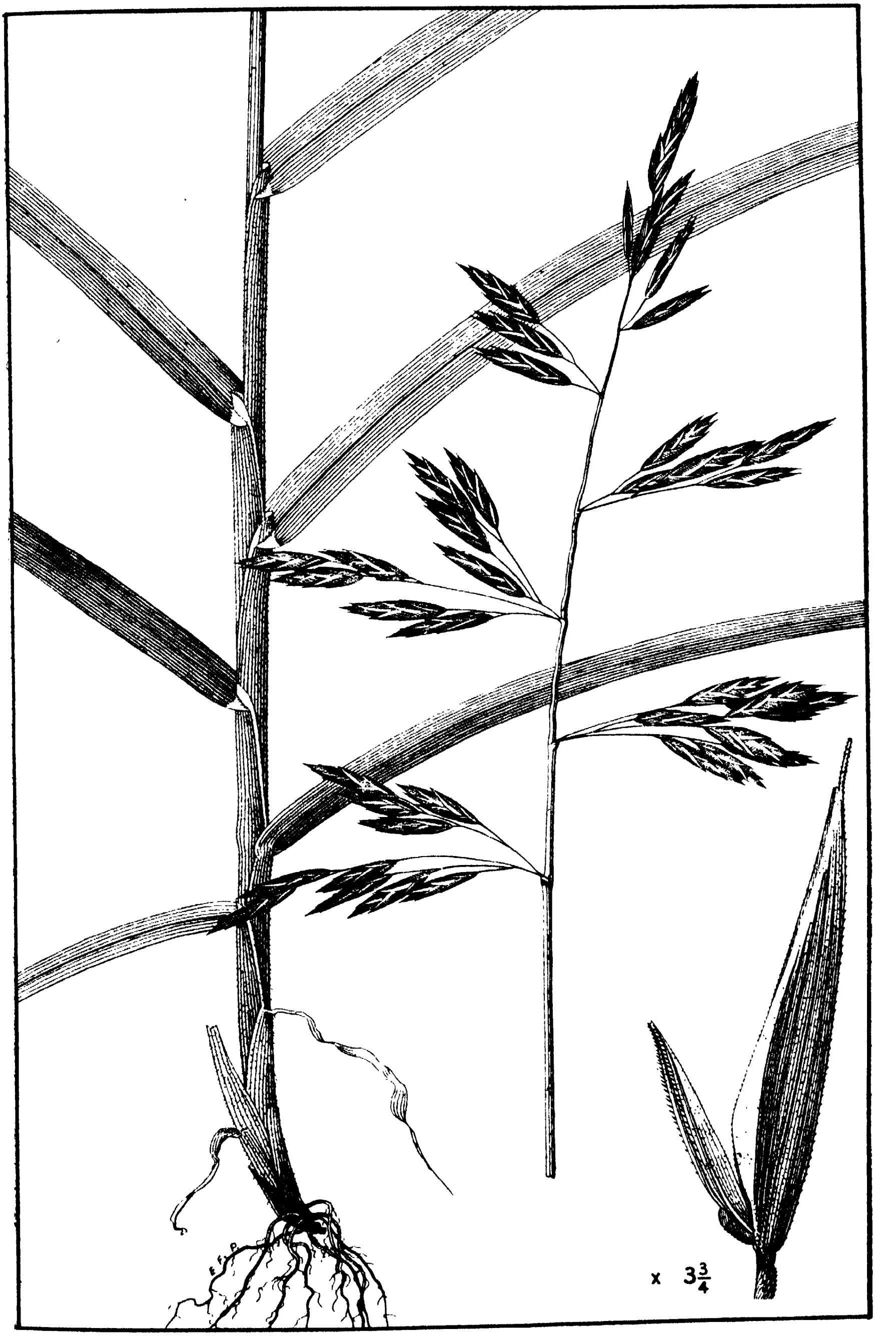


Fig. 5.—Prairie Grass (*Bromus unioloides*).
Note that the spikelet is much larger than that of ***Bromus inermis*** (Fig. 6).
It is also much more rigid and sharp-pointed.

POPULAR DESCRIPTIONS OF GRASSES.

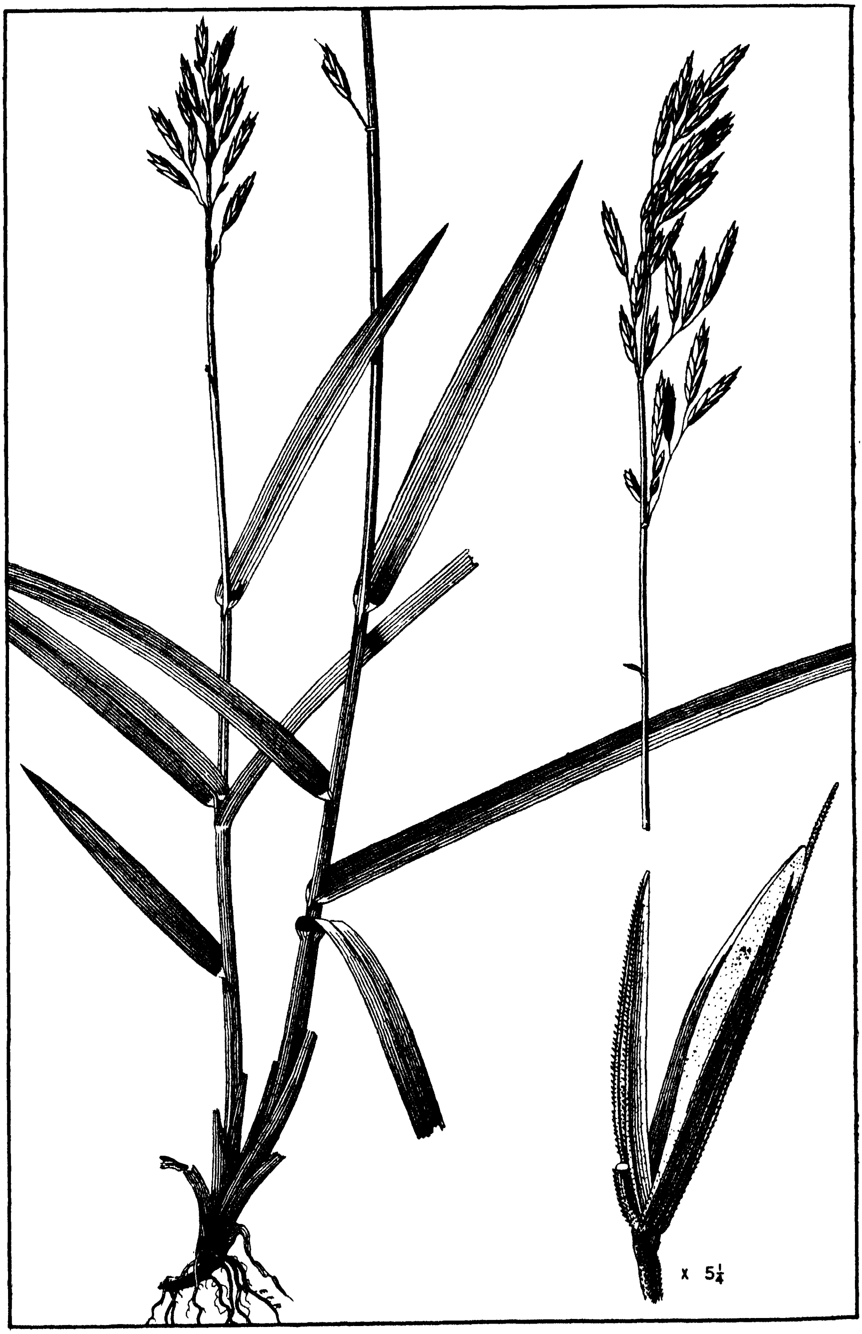


Fig. 6.—Awnless Brome Grass (*Bromus inermis*).
Compare with Figure 5.

POPULAR DESCRIPTIONS OF GRASSES.

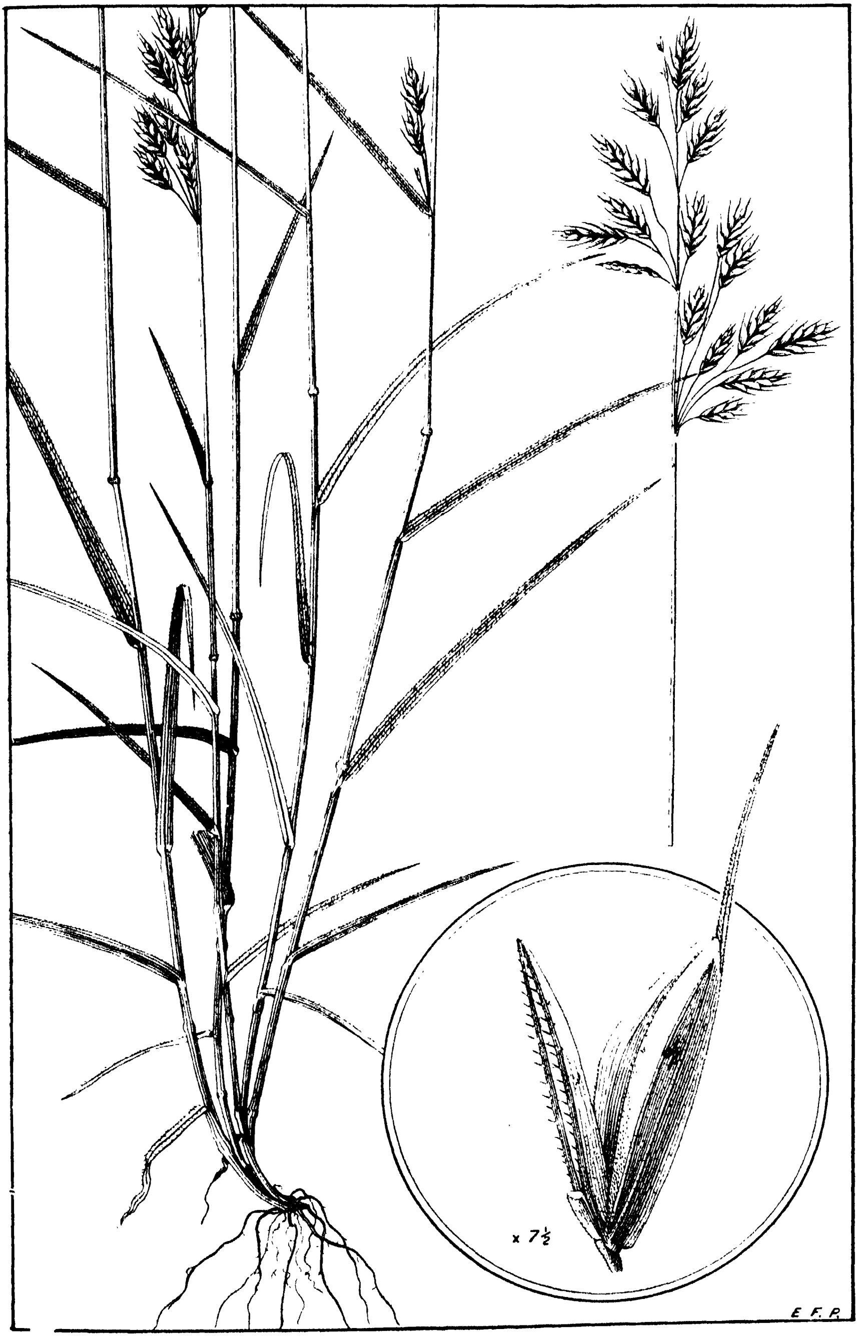


Fig. 7.—Chess or Cheat (*Bromus secalinus*).
Note the very inflated spikelet—a characteristic feature of this grass.

POPULAR DESCRIPTIONS OF GRASSES.

AWNLESS BROME GRASS (*Bromus inermis*).

This is an introduced perennial grass, being a native of the dry sandy regions of Europe and Western Asia. In many parts of the United States the grass is considered superior to all other native or introduced grasses In this State, however, the grass is hardly ever seen outside the Experiment Farms on the coast and tablelands. One of the probable causes of this is the fact that the grass grows extremely slowly, and unless the ground has been specially prepared, and all possible weeds removed prior to sowing, it will probably be crowded out during the first year.

The grass can readily be distinguished from Prairie. The seed-head is shorter, softer, and less spiny ; the leaves are a dirty green colour, in contradistinction to the vivid green of Prairie ; and it has also underground creeping root-stocks developed.

Up to date, it has done best on the light soils of Hawkesbury Agricultural College and Bathurst and Glen Innes Experiment Farms. The grass is not at its best until the second or third year. When established it will endure a good deal of trampling. The palatability of the grass has been proved to be of a very high order. A plot at Glen Innes Experiment Farm is very much favoured by sheep ; and in a test carried out at Hawkesbury Agricultural College, including this grass and several English grasses, it was preferred to any of the latter.

Awnless Brome grass has done extremely well on the Irrigation Area. The trials at the Yanco Experiment Farm indicate that it is slightly affected by frost, but it soon recovers in the spring, and thence onward makes very rapid growth. On the Hay Irrigation Area the grass was stocked, with exceedingly satisfactory results.

The habit of the grass is very variable. Three distinct strains have been noticed at the College—a thick, compact bushy form, suitable for grazing ; a tall and slender form, more suitable for hay ; and a type somewhat intermediate between the two, but producing heavy crops of seed.

The seed is retailed at about 1s. per lb., and 32 lb. are required to sow an acre, which is best done in the autumn.

A Brome Grass of limited use.

Bromus secalinus, commonly known as Chess or Cheat, is an annual introduced grass, characterised by a full plump appearance of the seed, which, when mature, separates from the central flower stalk (rachis) and exposes the latter to view.

This grass is not so common as the other Brome grasses, being found principally in the Riverina and western wheat districts. It is considered a palatable grass, and, as such, has a certain amount of value in fallowed lands and pastures. In one State of America, that of Oregon, it is cultivated as a hay crop. Its heavy seeding qualities, however, and the ready germination of the seed, cause it to spread into wheat fields, where it is likely to become an obnoxious weed.

Maize Experiments, 1916-17.

BATHURST EXPERIMENT FARM.

E. GOLLEDGE, Assistant Experimentalist.

AN experiment was conducted at Bathurst in order to test the yields of three strains of Reid's Yellow Dent maize, and generally to provide seed for the use of the Department. At the same time it was decided to conduct a subsidiary experiment to test the advisability or otherwise of suckering maize.

In many districts of this State it is a common practice to remove the suckers from the maize crop, not merely to provide feed for stock, but because it is thought that such operation increases the yield. In any experiment previously carried out very little difference in yield has been obtained between suckered and unsuckered maize, but in most cases the slight difference was in favour of the latter. It is recognised that a better yield is likely to be obtained from unsuckered maize in a good season, but it is doubtful whether any experiment has shown as great a difference as the one recorded here.

An average difference of 21 bushels per acre in favour of the unsuckered maize is shown in the test, a remarkable increase, notwithstanding that the season was favourable to some addition to the yield.

But the matter is being further experimented with, and it is yet too early to draw definite conclusions.

For the experiment a half-acre block was planted on the alluvial soil of the river flats embraced in the farm irrigation area. The seed was drilled in with the maize dropper on the 21st October, 1916, with superphosphate at the rate of 1 cwt. per acre. The number of rows and the order in which they were sown are as follows:—

Rows 1 and 2... ...	Mixed strains (buffer).
,, 3, 4, 5, and 6 ...	Seed from Messrs. Ainsworth & Sons, U.S.A.
,, 7, 8, 9, and 10...	Seed from Department of Agriculture, U.S.A.
,, 11, 12, 13, and 14	Seed from Bathurst Experiment Farm, 1916. Selected seed (originally from Narara).
,, 15 and 16 ...	Mixed strains (buffer).

The rainfall during the growing period was as follows:—

October, 1916 (from 21st)	21 points.
November	290 ,,
December	572 ,,
January	185 ,,
February	539 ,,
March	46 ,,

Total, 16·53 inches.

All the plots germinated well, and owing to the maize suckering profusely it was decided to remove the suckers from the last two rows of each strain, viz., 5 and 6, 9 and 10, 13 and 14, and to compare the yields from each pair of rows. The suckers were removed on 22nd January, 1917. The land was not irrigated, the rainfall being sufficient. Harvesting was completed on 6th May, 1917.

The yields were as follows:—

Rows.	Cob Weight per plot.			Grain Weight per plot—80 per cent. of Cob Weight.	Yield per acre.
No.	c.	q.	lb.	bus.	bus.
1, 2 (buffer)... ...	3	1	20	5·48	87·68
3, 4	3	0	17	5·04	80·64
5, 6	2	1	20	3·88	62·08
7, 8	3	1	9	5·33	85·28
9, 10	2	2	1	4·01	64·16
11, 12	3	1	27	5·58	89·28
13, 14	2	2	9	4·13	66·08
15, 16 (buffer) ...	3	1	3	5·24	83·84

From the point of view of strain, the results may be summarised as follows:—

	Unsuckered.	Suckered.	Average.
	bus. per acre.	bus. per acre.	bus. per acre.
Bathurst Seed	89·28	66·08	77·68
Department of Agriculture, U.S.A. ...	85·28	64·16	74·72
Ainsworth's Seed	80·64	62·08	71·36

This is another illustration of the value of acclimatised seed maize, increases of 3 and 6 bushels being shown over seed of American origin.

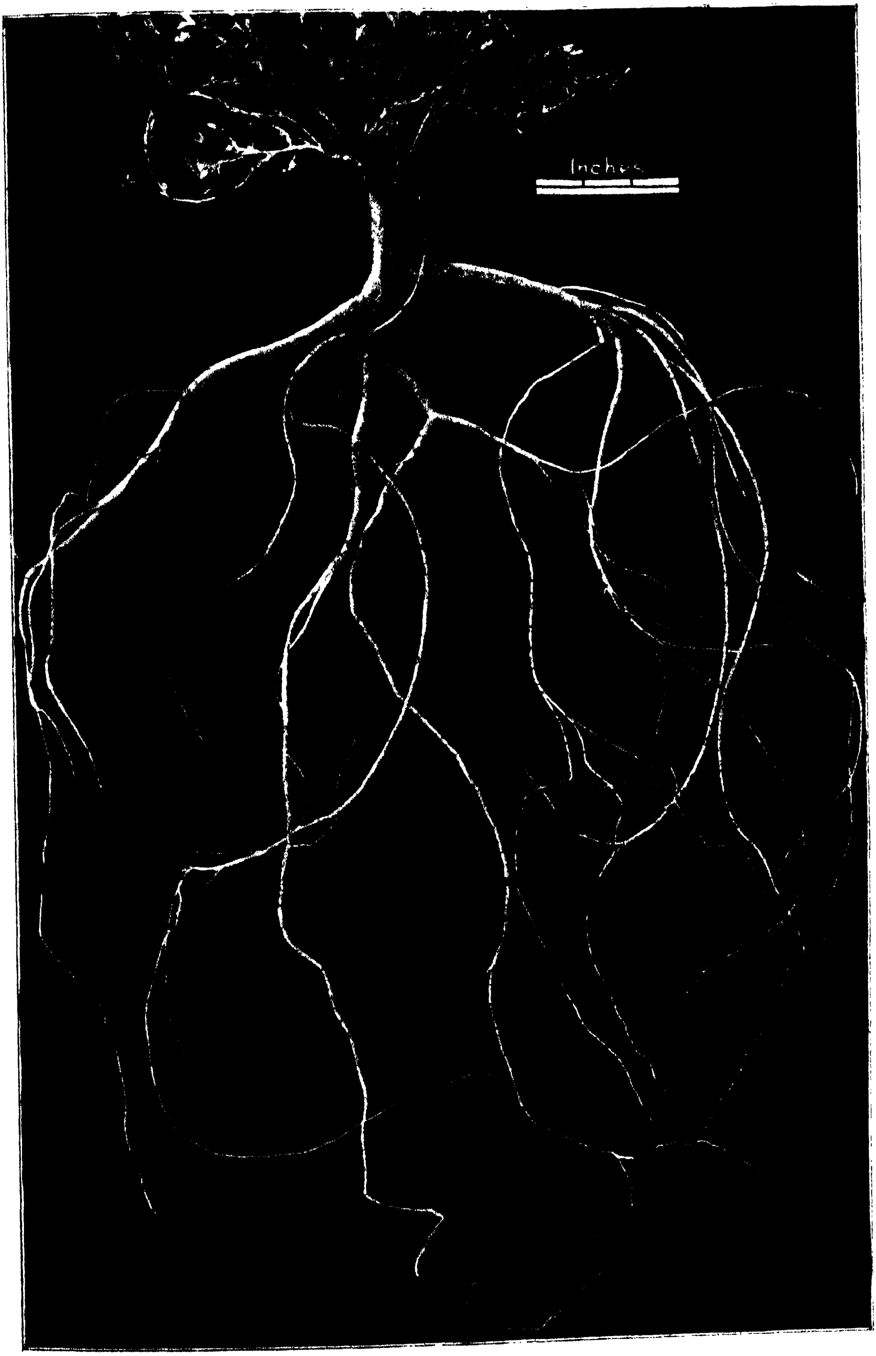
Viewed from the standpoint of suckering, the results are distinctly against the practice under the conditions.

	Unsuckered.	Suckered.	Difference.
	bus. per acre.	bus. per acre.	bus. per acre.
Bathurst Seed	89·28	66·08	23·20
Department of Agriculture, U.S.A. ...	85·28	64·16	21·12
Ainsworth's Seed	80·64	62·08	18·56
Average	85·06	64·10	20·96

Lucerne at Coonamble Experiment Farm.

The accompanying illustration shows the root system of a lucerne plant which represents two years' growth in an open cultivation paddock. Two drills wide were sown with a wheat crop as an experiment, and in spite of the fact that it had no attention, and was grazed heavily, the lucerne is still thriving.

In consequence of the success of this experiment an area of 40 acres has been sown, with possibly an additional area later.—W. R. Colwell, Manager, Coonamble Experiment Farm.



Root System of Lucerne Plant, Cooramble Experiment Farm

A NEW GARDEN ESCAPE.

WITH reference to a note under the above heading in the October issue of the *Agricultural Gazette*, Mr. C. T. White, Acting Government Botanist of Queensland, writes that while the plant known as "Cape Ivy" in New South Wales is *Senecio mikanioides*, the plant known as "Cape Ivy" in Queensland is *Senecio tanoides*, which is a rampant climber, very common in gardens, and during July and August becomes a mass of yellow blossom. Needless attention has been drawn to the plant in the Queensland press owing to popular confusion with *Senecio latifolius*, the well-known poison weed. He has never seen it growing sufficiently in any locality to warrant it being termed in any sense a weed; in fact, has never even met with it as a stray from garden culture. *Senecio mikanioides*, which is believed to be more or less of a nuisance in some localities, he has never seen in Queensland. "I write you as probably our plant is growing in some of your North Coast areas, and judging from Queensland experience, certainly no one need hesitate to grow it for fear of it possessing any deleterious properties, or of it becoming a nuisance."

EFFECT OF PEPSIN WHEY ON CALVES.

IN September the Dairy Branch of the Department of Agriculture received an inquiry from Tenterfield *re* the effect of pepsin whey on calves, inasmuch as one of the local suppliers had lost calves and had attributed the deaths to the pepsin whey.

This was the first time that this matter of feeding calves with pepsin whey had cropped up, and in view of the scarcity and the high price of stock at the present time, it was considered worthy of attention. Inquiries were therefore made of different district officers of the Dairy Branch who came in contact with cheese factories where pepsin is used as a coagulant, and it would appear that there is a slight divergence of opinion as to the effect which pepsin whey has on calves.

In one case, on the South Coast, Mr. Jauncey, of Mountain View Cheese Factory, Bega, stated that he had had great difficulty in rearing calves since he had used the pepsin.

On the other hand, Mr. H. J. Parbury, of Moruya, a well-known dairy farmer and cheese-maker, stated that he found no difference in results with his calves when fed on pepsin whey, as compared with rennet, and was of opinion that any trouble arising in the rearing of the calves must have had some other cause.

At the Kiora Cheese Factory many of the suppliers interviewed seemed quite satisfied that pepsin whey is satisfactory for calf feeding.

On the North Coast, one farmer, who was interviewed, stated that last year he successfully reared ninety calves on pepsin whey out of a total of 100, and that the pepsin whey was in no way to blame for the deaths of the others.

The general opinion in one district on the South Coast is that if the whey is properly steamed there would be no risks of any ill-effects whatever.

The Department, therefore, recommends that pepsin whey be thoroughly steamed before use, heating to at least 160 degrees Fahr. —L. T. MACINNES.

Coccidiosis in Poultry.

SYDNEY DODD, D.V.Sc., F.R.C.V.S.,
Lecturer in Veterinary Pathology and Bacteriology, University of Sydney.

IN the spring of 1916 a number of young chickens from several poultry establishments were submitted to me by the Poultry Expert, Mr. Hadlington, through the Chief Inspector of Stock, for pathological and bacteriological examination. The result of such examination was that chicks from tour different poultry farms were found to be affected with a disease known as coccidiosis. This disease has apparently hitherto not been recognised as existing in poultry in this State, although it is well known in other States. The Poultry Expert, however, is of opinion that it is by no means new to New South Wales, but has existed here for some time. Last year it was predicted that if inquiries were made it would be found that coccidiosis was much more wide-spread around Sydney than was imagined, and unfortunately these predictions have turned out to be correct. Already this year a number of other poultry establishments have been found to be infected with the disease.

It is in view of the wide-spread and serious nature of the disease as it concerns poultry breeders that the following notes have been written, in order to make them acquainted with its nature, cause, and means of prevention. There is, however, no need for scare on the part of poultrymen, as the old adage—" A danger understood is a danger half conquered "— holds good in this case.

Coccidiosis is the name given to a group of diseases affecting a variety of animals, *e.g.*, cattle, sheep, goats, rabbits, birds, &c. In animals the disease is the cause of serious losses in various countries, but it is the condition as it affects birds, especially poultry, that is described here. Mention might be made, however, of the fact that the organism responsible for the disease in birds is apparently a different species, although appearing similar under the microscope, from that affecting animals.

The condition goes under a variety of names in different countries. They are not given here, as it is not desirable to perpetuate a number of synonyms when one name suffices. One of the names deserves mention, however, as it is a source of confusion in some poultry books, viz., " White Diarrhœa." This name is also used in connection with another very serious disease of young poultry, but is due to quite a different parasite.

The disease is not confined to chickens, but all species of birds may be attacked, both wild and domesticated.

The Cause of the Disease.

The cause of the condition is a protozoan parasite known as *Eimeria* (or *Coccidium*) *avium*. It is a very small organism, and needs a microscope for its detection. Injury to its host, *i.e.*, the chicken, &c., is caused by the parasite invading the cells lining the intestinal tube and destroying them. In very young chicks the parasites may also invade the liver.

Life Cycle of the Parasite.

In order to appreciate the effects produced by the coccidium, and to devise measures to check its ravages, it is necessary to know its life-history. This is here set out in as simple a form, and as devoid of technicalities as possible, in order that the non-scientific reader may follow it.

The mature coccidium is known as an *Oöcyst*. This is developed in the intestines of the affected bird and passed out with the excreta. In shape it is very like a miniature fowl's egg, with an extremely resistant capsule or covering. The contents at first fill up the Oöcyst. Then the contents gradually split up into two rounded bodies, and later into four. These are known as *Sporoblasts*. Each of these spheres contained in the Oöcyst becomes ovoid and is then known as a *Sporocyst*. A *Sporocyst* divides into two, each segment forming what is known as a *Sporozoite*. The Oöcysts and the Sporocysts are extremely resistant to injurious influences owing to their covering, and so are capable of setting up infection a long time after they have been voided in the excreta. In soil they have been kept alive for twelve months, but in water they do not survive for so long a period, although even when the capsule has been destroyed by maceration, the Sporocysts remain infective for some time afterwards.

The mature coccidium, having lain for a variable period in the soil or other situation, is swallowed by its host, viz., a chicken or other bird. The protective covering is dissolved off the parasite by the intestinal, or rather the pancreatic, secretion, and the sporozoites are set free in the intestines. The sporozoites then make their way into the cells lining the wall of the bowel, where they multiply very rapidly, each one first increasing in size and then splitting up into a number of smaller segments. The increase in size is at the expense of the invaded cell, which it eventually destroys. The smaller segments resulting from the division of the organism are known as *Merozoites*. These are set free by the rupture of the intestinal cell containing them. Many of them burrow into fresh cells, where they increase in size, break up into a large number of segments or merozoites, destroy the invaded cell, setting free the fresh merozoites to repeat the process for some time but not indefinitely. The foregoing process does not need any male and female elements for its carrying on, and is known as the asexual stage. During this process large tracts of cells lining the bowels may have become destroyed, resulting in the train of symptoms observed in connection with this disease and often in death.

As stated, the asexual method of reproduction cannot go on indefinitely. There comes a period when, either on account of its surroundings becoming unfavourable for its continued existence, or the vitality of the parasite has become lowered, when the organism needs to provide for the propagation of its race. This is brought about by means of a sexual process. The Merozoites, instead of continuing to grow, and then split up into other Merozoites, become transformed into male and female elements. The female element becomes fertilised by the male element, the former continuing to develop a resistant covering, and then becomes the mature coccidium or Oöcyst. The non-sexual elements, although capable of very rapid multiplication in the body of their host, are nevertheless not very resistant to destructive influences, and although many of them are passed out with the fæces, they do not very long survive destructive agencies brought to bear on them outside the body. On the other hand, the contents of the mature Oöcyst form a constant number of Sporozoites, and no increase in numbers of the parasite occurs, once it has been matured, until it has gained entrance to the intestines of its host, but, unlike the asexual forms, the mature sexually-formed parasite is able to survive for long periods outside the body of the bird without undergoing any damage.

The mature coccidium or Oöcyst gradually passes down the intestines and is finally voided in the excreta. If this is subsequently swallowed by a bird, its covering is dissolved and the cycle repeated. It will be noted that, theoretically, a single Oöcyst or mature coccidium is capable of giving rise to an indefinite number of parasites in the intestinal canal. It has been estimated that the entire life cycle of the parasite, or rather the time elapsing from the swallowing of the mature organism to the appearance of a new generation of mature coccidia in the excreta, is about ten days, occasionally a little less or a little more according to external conditions.

Method of Infection.

Birds are most commonly infected by swallowing food or other materials contaminated with excreta containing the mature parasite. It will be noted later that old birds may be a very potent and unsuspected source of danger as the disease is very seldom fatal in them, and yet they act as carriers of infection by the fact that the parasites may be passing out in their droppings. It has also has been shown that fowls' eggs may become contaminated by excreta containing coccidia as they are being laid, and thus young chicks may and do become infected very soon after being hatched even in the incubator.

How the Disease may be Spread.

Regarding the spread of the disease from an infected to a healthy poultry run, no doubt the most common method is the introduction of infected birds which are apparently healthy. Such birds are, however, voiding coccidia in their excreta and thus contaminating the new yards. No doubt the selling of very young chicks, whether hatched in an incubator or naturally, from infected establishments is a fruitful means of spreading the disease. Infection may also be conveyed from one place to another by intermediary agents, *e.g.*, eggs soiled with infected excreta, poultry crates, second-hand incubators, brooders, &c. It may also be spread by wind blowing the dried excreta on to adjoining properties or by rain washing such material on to fresh ground. Nevertheless, these last two methods are only of secondary importance as compared with the others, the most important being the infected bird itself.

Accessory Causes.

In the first place, it must be realised that no matter how favourable the conditions for its propagation, unless the parasite is present coccidiosis cannot occur. On the other hand, the parasite may be present on an establishment and yet little or no mortality from the disease be experienced, owing to the fact that good hygienic conditions have been maintained on the property and the general well-being of the birds has been looked after by the owner. Therefore, if a fresh outbreak of coccidiosis is diagnosed, it indicates that the causal organism has been recently introduced, or that it had been present on the establishment all the while, but that conditions had hitherto not been favourable for its abundant propagation and resulting death rate in the chickens Conditions favouring the spread of the disease to new places and its continuation on already infected localities are:—overcrowding of runs or pens, dirty moist fowl-runs, dirty feeding utensils, and, with regard to very young chicks, exposure to chill, especially if the temperature of the brooder has not been properly regulated. In short, anything which tends to lower the vitality of the bird predisposes it to a fatal attack of the disease. Furthermore, dirty runs, dark corners, moist soil, unclean feeding utensils, all serve to protect the parasite from those natural agencies which tend to destroy it, and thus help to keep it alive for a much longer period than if the conditions were the reverse.

Age of Birds Attacked.

Birds of any age may become infected, but by far the heaviest mortality occurs in very young chicks, especially those hatched in incubators. Death from coccidiosis is unusual with adult birds, particularly if they have been allowed plenty of living space. I have fed adult fowls with portions of intestines of young chicks containing myriads of coccidia, without producing any very marked sign of illness, and yet these birds were passing parasites in their fæces for some considerable period afterwards.

Symptoms.

As just stated, in old birds the symptoms of coccidiosis are negligible, but at the same time these birds may be acting as carriers of infection.

In young chicks a few days old, they become dull; their wings droop; they are continually crying; the comb or beak becomes a leaden tint. In birds of this age, little or no diarrhœa is seen; in fact, in the majority of such birds examined by me no diarrhœa at all was evident. In birds up to a fortnight old diarrhœa is usually present, the excreta being of a white or creamy colour. The odour may be offensive. These birds often have a good appetite, and drink much more water than usual, but in spite of feeding they waste away and become very anæmic, shown by the pale colour of the comb, &c.; feathers tend to fall out. If the disease is severe, the fæces are quite liquid; if mild, the excreta is more solid. But many of these symptoms are not necessarily confined to coccidiosis, and only microscopical examination can determine its presence.

In a number of such birds when the infection is severe, death often occurs either during the acute stage of the disease or after it has become chronic. In older birds, up to a few months of age, from my own experience, the disease usually occurs in the chronic form. The birds are in poor condition, diarrhœa and constipation may alternate, the droppings being at times greenish or even blood-stained in appearance. The birds mope, and their appetite is capricious. A large proportion of such birds may survive, but their general health seems to have received a shock from which they do not entirely recover.

Course of the Disease.

As remarked, young chicks are far more susceptible to acute coccidiosis than older birds. Young chickens, up to about a week old, die within a few days after swallowing the parasites. Indeed, death may be so rapid that the breeder may not suspect infection at all. If infected at about a fortright old, the young birds do not die off so rapidly. They may live for a week or two, or may even survive. Such birds become chronically infected, and may be found passing parasites in their excreta for a considerable period afterwards Older chickens may become infected, but are much less likely to die from the disease; in fact, it is rather the rule for such to recover.

The mortality varies considerably. It may range from only a few chicks up to the whole brood. In the cases under my own observation the death rate in young chicks, from a few days to a fortnight old, has been from 20 per cent. up to 80 per cent.

Post-mortem Appearances.

To understand a detailed description of the changes taking place in infected birds would require a knowledge of pathology and bacteriology. Therefore all that is mentioned here are such changes as the poultry breeder may observe himself.

In very young chicks a few days old, in which the disease has run a rapid course, there may be nothing unusual observed by the naked eye. There may be no evidence of diarrhœa or inflammation of the bowels. In fact, death may have occurred so suddenly that there has not been time for mature coccidia to pass out with the droppings. Consequently the microscopic examination of such excreta may fail to show any adult parasites at all, although the non-sexual forms may readily be found in the intestines.

If death has not occurred so rapidly, the contents of the bowels are creamy or milky white, and very fluid. The lining of the bowel near the gizzard may show irregular inflamed patches varying in size. The contents of the cæca (the two short blind-ended tubes running alongside and opening into the end of the bowel) will be found to vary very considerably, both in amount and nature, according to the length of time the disease has existed. The cæca almost always contain coccidia in enormous numbers, an exception perhaps being in the very young chick when the onset of death has been rapid. In the early stages these blind tubes may appear empty and present no naked eye changes. Later on they become distended with a milky or cheesy material.

Still later the cæca may be packed with a hard, dry, substance, often reddish in colour from the hæmorrhage that has taken place. In such material mature egg-shaped coccidia abound. The lining of these tubes may also be considerably inflamed. Often, when no parasites or only a few are to be found in the excreta, the contents of the cæca may be swarming with them.

At times in the very young bird, the liver may be enlarged and contain more blood than usual. This often leads poultrymen to consider that the birds are dying from liver disease. I have never been able to find parasites in the liver of young chicks. So far as the diagnosis of this disease is concerned the very acute form may be readily mistaken for other diseases, and a microscopic examination is necessary to make a positive diagnosis. At the same time the presence of a few coccidia in the fæces does not necessarily conclusively prove that the birds are dying from coccidiosis, especially in the case of adult fowls. In chronic cases, the lining of the bowel walls is often so damaged that the victim readily becomes a prey to other organisms which otherwise would have no effect upon the health of the bird.

Treatment.

In this, as in all other diseases of poultry, the aim of the poultry breeder should be prevention and not cure. On the establishment where the disease has not appeared, care should be taken that it is not introduced The scientific way would be to examine the droppings of all birds before placing them with the others. Such a procedure is of course quite impracticable. But the owner can at least make sure that his birds come from a healthy establishment, and, in the case of young chicks, that they are not brought from a place where the death rate has been high in the recently-hatched chicks, no matter what explanation the seller may give to account for the mortality. The purchaser will also note whether there are any of the signs mentioned under the heading of symptoms, in the young birds.

Seeing that the eggs themselves may act as carriers of infection, precautions should be taken before placing them in the incubator, taking care of course not to injure the eggs so that they will not hatch. It has usually been recommended that eggs should be washed with strong alcohol (methylated spirit will do) and allow them to dry in the air before placing them in the incubator. No second-hand baskets, crates, incubators, &c., should be brought on the premises without being first well disinfected. In establishments where the disease already exists, the incubator trays, brooders, &c., should be washed with a 5 per cent. solution of a good disinfectant, and then allowed to dry thoroughly in the air before being used. Fowl houses, coops, perches, &c., should be first cleaned and then lime-washed. If possible, fresh ground should be used each season for the young chickens. The ground that has been vacated should be sprinkled with freshly-slaked lime. Care, however, should be taken in the use of this material on ground over which poultry are running, as it tends to injure their feet, and also the lime powder is apt to get into the nostrils of the birds and set up catarrh. The necessity for cleanliness with utensils, &c., needs no emphasising.

With regard to curative treatment, this is of very little use in the very young chicks where the disease is running such a rapid course; but in a large number of instances, when the course of the disease is slower, especially in older birds (not including adults, however, which seldom die from the disease even with no treatment), the lives may be saved if suitable means are adopted. It is quite impracticable to dose fowls independently, and therefore the medicament given is usually placed in the drinking water. The following are considered to be efficacious in killing the parasite in the intestines:—

Sulphate of iron, 10 grains dissolved in each gallon of drinking water. Some commercial sulphate of iron powdered finely and well mixed with a little slaked lime and scattered about the runs should be beneficial. It would help to kill off the parasites on the ground, and if swallowed to kill those in the bowels.

Powdered catechu, 10–15 grains in a gallon of drinking water, has been found very efficacious as a curative agent. Its use can be continued for about two or three weeks, but if maintained longer it is apt to cause constipation.

Permanganate of potash dissolved in the drinking water until the latter is permanently stained, is recommended by some investigators.

THE USE OF OFFAL MANURE AND DRIED BLOOD FROM ABATTOIRS.

THE offal manure from the abattoirs is the residue that has been steamed in the digestors to remove grease, and then steam-dried (with constant stirring) in jacketed iron cylinders until it is dry, and is reduced to a fine mechanical condition. It can be dried economically, so that it does not contain more than 10 to 12 per cent. of water, and in this state may contain as high as 5 to 7 per cent. nitrogen and 13 to 16 per cent. phosphoric acid.

The blood from the abattoirs, which is dried in the same way, is generally considerably higher in nitrogen, but it contains very little or no phosphoric acid. The average composition of good samples of these products, supplied by the Meat Industry Board, is as follows:—

	Offal. per cent.	Dried Blood. per cent
Nitrogen	6·98	10·71
Phosphoric acid	12·87	—

The composition of offal varies slightly, according to the nature of the material and the condition of the carcase. Dried blood is fairly constant in composition. From the analysis it will be seen that dried blood is a purely nitrogenous manure, whereas offal manure, though poorer in nitrogen, contains also phosphoric acid. Neither of them, therefore, is what is known as a complete manure; that is, they do not contain those elements required for plant food, namely, nitrogen, phosphoric acid, and potash, in which soils are often deficient. In the case of the offal manure, potash salts or ashes containing potash, must be added to make it a complete manure. In the case of the dried blood manure, both phosphate and potash must be added to make it complete. Dried blood commands the higher price per ton on account of its higher content of nitrogen, which is the most expensive of the manurial ingredients.

Method of Application.—Both offal and dried blood are best broadcasted, and lightly harrowed in. This should be done before the seeds are sown, so that the manure may be well mixed with the earth, and not come in contact with the seeds in its raw state. For fruit trees or standing crops it can be applied at any time as a top dressing, being mixed with loam before application, or lightly harrowed in immediately after. Thorough mixing with the soil is essential, as the efficiency of the manure depends upon its fermentation. For this reason moisture is necessary, and disappointing results are to be expected if the soil is too dry for fermentation to take place.

Where the soil is dry, it is a good plan to compost the offal and dried blood in a heap with lime and soil in alternate layers, covering the heap with soil to prevent loss of ammonia, and keeping it moist with urine, waste water from the farm, &c., which may conveniently be poured at frequent intervals through a central passage left open for the purpose. On account of the fact that fermentation is necessary in order to render the nitrogen available to the plants, these manures do not give immediate results, and some time must be allowed for them to undergo fermentation before results are to be expected.

Rate of Application.—For land which is to carry ordinary crops, such as vegetables, fodder crops, &c., a dressing of 4 to 5 cwt. per acre of offal manure would be a fair dressing; and for fruit trees in full bearing up to 12 years old, 5 to 6 lb. offal manure per tree. Somewhat larger quantities should be used for older trees.

In the case of dried blood, about half the above quantity will provide the same amount of nitrogen.

Offal manure, blood and bone manure, and dried blood are all suitable for use on any class of soil, and for any kind of crop. They have the advantage over chemical manures containing nitrogen and phosphoric acid, such as sulphate of ammonia and superphosphate, that they contain organic matter in addition, which produces humus—an extremely valuable soil constituent. They have the disadvantage that, even under favourable conditions, they are slower in their action; at the same time, this disadvantage is compensated for to some extent by the fact that their beneficial action is more lasting, and that they are not so liable to be leached out.

Two points to which attention has been previously drawn must not be lost sight of: (1) that neither offal nor dried blood is a complete manure, and (2) that good results are not to be expected if the soil is too dry. Failure to realise these facts may result in disappointment.—F. B. GUTHRIE.

The Olive.

Its Introduction into Australia.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

THERE is no mention of the olive having been brought out in the First Fleet.

In *Hist. Rec. N.S.W.*, iv, 277, it is recorded that George Suttor landed in Sydney (28th December, 1800) one olive which was sent out, with other plants, by Sir Joseph Banks. He was a London market gardener and a protégé of Banks.

He went to England with George Caley in the "Hindostan," and gave evidence on behalf of the deposed Governor Bligh. He left Sydney 12th May, 1810, and returned to Sydney 12th May, 1812.

> Among some valuable plants introduced into the Colony by Mr. Suttor, who returned in the "Mary," are several plants of the date palm and olive in a healthy state. These plants are natives of the Grecian Isles and most parts of Italy, where they are much cultivated, and furnish a great part of the food of the inhabitants. From the olives of these countries the best sweet oil is produced, and as the plant flourishes in climates very similar to ours, we have reason to hope it will arrive to perfection here.
>
> The date tree produces a nut of a farinaceous kind, and is frequently used in the place of bread, is an abundant bearer, and will thrive in almost any soil. It is accustomed to frost in its native country, and will, it is also hoped, add to the variety of our vegetable productions.—(*Sydney Gazette*, Saturday, 23rd May, 1812.)

It is impossible to assume that the olives of Suttor (who was a skilled cultivator) died, and therefore it seems proper to say that he was probably the introducer of that plant into Australia.

I have already (*Agricultural Gazette*, June, 1917, p. 429) drawn attention to the fact that Captain John Macarthur and two of his sons, after the downfall of Napoleon, travelled in France and Switzerland studying the cultivation of the olive and the vine. He brought some olives to New South Wales in 1817 just a century ago.

In November, 1831, Major Mitchell, starting on one of his expeditions (*Three Expeditions*, i, 5), says: "My first day's journey terminated near Parramatta, at the residence of Mr. John Macarthur . . . he pointed out to my attention the first olive tree ever planted in Australia. Here, also, I saw the cork tree in full luxuriance." There are other notes about interesting plants, and the owner was, of course, the redoubtable Captain Macarthur.

This reference to the "first olive tree" is not easy to understand. I have already pointed out that George Suttor had introduced the olive, both in 1800 and in 1812, and it is probable he planted the 1800 olive in the Governor's Garden in Sydney, since it belonged to the Government, while the 1812 olives, which were doubtless his private property, were probably planted on his land at Parramatta. He says: "I have had long experience in the culture of the vine and the orange on my land, near Parramatta. I first planted my own in the year 1801. . . ." (George Suttor in the "Culture of the Grape Vine and the Orange in Australia and New Zealand," 1843, page iv.) He does not mention the olive, as his book is on another subject.

It seems to me that Major Mitchell, if he saw "the first olive planted in Australia," forgot Suttor's plant of 1800, and if he was then referring to Captain Macarthur's plant, it could not have been as early as Suttor's of 1812. We know that Macarthur was in poor health in 1831, and a statement of his might have been misunderstood. But it seems to me that, as in the case of the vine, he was the first Australian resident, with a considerable knowledge of Australian conditions, who toured Europe with a view of studying the growth of the olive, in order that he might apply such knowledge in his adopted country.

It will be seen presently that Commissioner Bigge also refers to Macarthur as the introducer of the olive. Suttor appears to have been a non-assertive man while he was in a humbler social position than Macarthur. The fact seems to be simply that he did not publish his claim abroad.

Bigge's "Report on the State of Agriculture and Trade in the Colony of New South Wales," &c., 1823, says, at page 93 :—

> The olive tree has been introduced into the Colony by Mr. J. Macarthur, and has already manifested indications of early assimilation to the climate. Its growth and progress have exceeded those of the olive trees in the south of Europe. With the view to accelerate the production of olive oil in the Colony, I should recommend that plants should be sent from England by every convenient opportunity in the convict ships, and that these should, in the first instance, be consigned to the care and management of the Colonial Botanist, and afterwards distributed amongst the respectable settlers who apply for them.

In the *Sydney Gazette* of 5th October, 1827, we find :—

> As an extraordinary instance of the effect of soil on vegetation, we may mention that in the Botanic Gardens there is an olive tree, six years old, bearing flowers. Now the olive is not known to bear in Europe until it is from 10–14 years old.

The cultivation of the olive was a favourite theme of the *Sydney Gazette*, and the *Monitor* (the opposition paper) did not deny itself the pleasure of having a go at the *Gazette* on the subject. The verbiage of the controversy is distinctly funny, and, judging by the experience of many years, the *Monitor* was right, at least as far as the Sydney district is concerned. The olive requires a calcareous soil for its full development, and Sydney can offer it all the other conditions it requires.

> The olive was a prolific source of national revenue in European countries, and it was long supposed by British horticulturists that New South Wales was a country in all respects congenial to its culture, and by some that it would add more to Australian wealth than even wool.—(*Gazette.*)

The editor in a leading article in the issue of the 14th February, 1829, advocated the expediency of our settlers growing the olive on the following grounds :—

(1) Its lucrativeness.

(2) Its adaptation to our climate.

(3) Its rapid and almost spontaneous growth, requiring no laborious nor expensive nursing, and growing in most barren and rocky soil.

It had been proved by Mr. Macarthur and others for some years that it would grow in New South Wales, and they had sent specimens of the oil home to the Society for the Encouragement of Arts and Manufactures, which had offered premiums for the encouragement of Australian enterprise, but the editor does not remember at the moment whether olive oil succeeded in getting a premium. He says :—

In regard to the Government Gardens at Sydney, the olive under the skilful superintendence of Mr. Fraser has been reared with great success. He has now not less than twelve or thirteen varieties, some of which were brought out from England in the year 1825 in rooted cuttings not 6 inches high, and are now in their fourth year in full and luxuriant bearing, and they produce an average of 100 layers each, besides innumerable quantities of cuttings.

Another supply brought out in the latter end of 1825 have attained the extraordinary height of 20 feet; and a stock brought out by Hon. Mr. McLeay early in 1826, are now from 10 to 12 feet high. One variety was from the stock of the Hon. John Macarthur, and is in its third year of bearing.

The editor remarks on the amazing rapidity of growth of the Australian olive, taking two circumstances into consideration tending to materially heighten the singularity of the fact.

(1) No general crop can be expected from a tree within its first year of flowering, but in the instance before us the rule is completely reversed, for our olives in the very first year of their flowering are full of fruit.

(2) In Italy it is a common custom to plant a grove of olives at the birth of an heir, and it reaches maturity about his coming of age, but in New South Wales the same olives arrive at luxuriant bearing in their third or fourth year.

The editor points out that as it does not require rich alluvial soil, many farmers who possess land suitable for pasturage or the plough can turn this land to a good use.

Also, as a further inducement, it can be obtained at the Government Gardens in Sydney gratuitously. "Mr. Fraser last year gave away not less than 500 layers, and for want of applications was under the painful necessity of destroying some thousands of cuttings, each of which, had it been thrust into some corner of any of our farms, would by this time have made rapid advances towards maturity."

The editor then states that it is now published for general information that Mr. Fraser had this year for gratuitous disposal upwards of 800 layers, and cuttings without number, and that it is the wish of His Excellency Governor Darling to promote by every means in his power the multiplication of colonial productions, and he has given directions that the Government Gardens shall afford every possible assistance to those who are disposed to try the capabilities of our soil and climate.

The *Monitor* criticises this leader, saying that the olive is principally used as a fruit, and that it flourishes most in the rich volcanic soils of Europe, and that after seventeen years' residence in the Colony he has never seen, much less tasted, an olive the growth of New South Wales.

The *Gazette*, in the issue of the 3rd March, 1829, states that the *Monitor* editor betrays his ignorance in the above statement, as the main utility of the olive consists in its diversified oils, and that on rich soils it languishes and on poor soil luxuriates; he adds that if the writer "would only step into the Government Gardens his scepticism would blush before the triple demonstration of sight, touch, and taste," and referred him to a letter by one of his most experienced correspondents (see below). He ends up by appealing to the readers to determine who is the "enthusiast" and the "romancer" in this matter—the man who speaks with scientific knowledge at hand, or the man who reasons without data, &c.

The letter in the *Gazette* of 3rd March is :—"I perceive, in the leading article of the *Monitor* of the 23rd ult., a severe critique upon your article in the *Sydney Gazette* of the 14th ult., respecting the advanced state of the olive in the Botanic Gardens. The sage editor religiously asseverates that 'after a residence of seventeen years in the Colony he never saw an olive the growth of the Colony, much less tasted one.' That may be; it is an old established proverb that there are 'none so blind as those that won't see.'

> "Mr. *Monitor*, I believe, is in the habit of visiting the Government Domain every morning, and occasionally finds fault with or approves of various objects which attract his inquisitive attention. He is aware that the Garden is open six days out of seven, and should his Monitorial Eminence stroll in, he will then (should his eyes be conveniently open) be enabled to see six distinct varieties of olives in bearing—one variety of which has upon it now what is considered by those who are acquainted with the culture of the olive a fair crop, and two others now in bearing have not been above three years in the Colony.
>
> "The learned editor would seem to know a great deal about the culture of the olive, and of the soil which it prefers, but let him examine the soil in which they are growing in the Garden, and should he detect any particle of volcanic earth he may truly be termed lynx-eyed, and I would ask him, allowing even that he had been in an alien grove, whether he ever saw plants in a more luxuriant state. He has hitherto professed himself a friend to the country; let him therefore cease to depreciate its capabilities, trivial as he holds them to be.—(Signed) A FRIEND TO HORTICULTURE."
>
> In its issue of 19th January, 1830, the *Gazette* reports that, "The crop of olives (in the Botanic Gardens) is abundant, which confirms what we have so often maintained, that this soil and climate are admirably suited to the production of that lucrative tree. We hope the settlers will pay increasing attention to it, confident that before many years they will find it a most profitable source of income."

Then we have a "Lecture on the Horticulture of New South Wales," delivered at the Mechanics' School of Arts, Sydney, by Thomas Shepherd, of the Darling Nursery (Sydney, 1835). At page 64 the lecturer gives a brief account of the cultivation of the olive, and refers to Busby's work of 1833 for further information.

We have also a "Catalogue of Plants cultivated at Camden" (1843), by J. and W. Macarthur. At page 12 we have under *Olea americana* (American olive) and *O. europœa* (the Common olive) six varieties named.

In the "Catalogue of Plants cultivated at the Darling Nursery, Sydney, . . . with remarks on the Cultivation of the Orange and Olive," by T. W. Shepherd, 1851, a page and a half are devoted to choice of land and methods of propagation, &c. No varieties are mentioned.

Mr. Charles Moore, in his Sydney Botanic Gardens Report for 1850, referred to the "Noble Trees of some of the best varieties of the genus," which furnished him with cuttings which he somewhat extensively distributed.

In his 1856 report he states that he expressed about 2 gallons of excellent olive oil from the fruits of "one or two trees."

Some of these trees are still in existence in both the Botanic Gardens and the Outer Domain, but on account of the absence of lime from the Sydney soil, olive trees have been a failure as compared with their success in Adelaide. The late Sir Samuel Davenport was a pioneer of the olive industry in South Australia, but a history of the olive in Australia is not the object of these notes. Those who desire to follow up the subject may refer to Sir Samuel Davenport's writings, to those of Mr. L. A. Bernays as regards Queensland, and the Rev. J. P. Bleasdale as regards Victoria.

The Care and Treatment of Starters for Cheesemaking.

MATTHEW WALLACE, Dairy Instructor.

THERE is probably no innovation in the treatment of milk for cheesemaking which has been so far-reaching in its effects, and which, when properly used, has done so much for the uniformity and improvement of Cheddar cheese as the introduction of lactic acid cultures, commonly known amongst cheesemakers as "starters."

These starters are obtained from pure cultures of one of the sets of organisms which produce lactic acid. When carefully managed and kept under proper conditions they are for all practical purposes pure cultures, inasmuch as the predominance of one species of organism practically smothers all intruders, thereby maintaining the comparative purity of the starter for a considerable period.

Starters are usually prepared from commercial cultures, which may be had in the form either of a powder or of a liquid. Where cultures have to be stocked for several months or transported great distances, the powder form is probably the most reliable. In powder form the cultures are supplied in sealed bottles, and the method of preparing the starter is as follows :—

Procure from 1½ to 2 gallons of fresh, clean, well strained, separated milk, or whole milk ; place in a can or bucket which has been scalded by steam ; heat to 180 degrees Fah., and keep at that temperature for one hour ; then quickly cool to 85 degrees Fah., add the culture powder and thoroughly mix with the milk. The vessel containing the starter should then be covered with a piece of freshly-scalded cheese cloth, and stood in a room with a sweet atmosphere, and with the temperature kept as near 85 degrees as possible. The milk should be stirred several times during the first few hours, as the powder will sink to the bottom of the vessel.

If the culture is at all lively and the temperature has not fallen too low, the milk will coagulate in from fourteen to twenty hours. It is rarely that the starter from the first cultivation gives the desired flavour, and three cultivations are in most instances necessary before a starter with a pleasing flavour is obtained.

A good starter should show distinct coagulation of a smooth velvety nature, and, when broken up, should be of an even consistency and free from lumps. The flavour should be distinctly acid, pleasant to the taste, and entirely free from anything objectionable. A primary consideration is activity. Starters showing vitality give more satisfactory results, and maintain their purity longer, than those which produce imperfect coagulations.

The addition of a starter to the milk for the production of cheese is in many respects similar to the sowing of clean seed on a piece of prepared land. The land, though carefully worked, still contains numerous weed seeds, which if left alone or thinly seeded will produce a growth covering the land with weeds; but if seeded with a sufficient quantity of good seed, the desired growth will keep the weeds in check or smother them out. If the seed is impure, or weak, or if the conditions of growth are abnormal or unsuitable, the weeds will make considerable headway.

Practically the same conditions govern the effect of starters on milk. As a result of the growth of desirable organisms to the almost total exclusion of those whose activity would be harmful to the manufactured article, a clean starter full of vitality will not only keep practically pure, but will, in a large measure, bring about favourable conditions in the milk and the resulting product.

Under ordinary conditions of factory management and careful treatment, comparatively little difficulty is experienced in making and maintaining a satisfactory starter; but there are times when trouble is met with, not only in factories where the facilities for keeping starters are not all that they might be, but also in those factories where the conditions leave little to be desired, and where the work is carefully and intelligently carried out. It is the object of this article to direct the attention of those engaged in the manufacture of cheese to this aspect of their work, and to examine the causes of trouble.

Under normal conditions it is practicable to prepare and keep a starter in a satisfactory condition for weeks, and instances are not wanting of starters in every way satisfactory which have been in use for several months. It has also been found that a starter which has been in use for some time may be revitalised by a change of scene. Starters which have been transferred from one factory to another are often considerably improved by the change; but it has also to be recorded that the result of a change is sometimes the reverse. What is the exact cause of this variation of behaviour cannot be definitely stated; but this much can be asserted, that under certain conditions of soil and climate, and other local conditions, some starters give better results than others. It is not, however, put forward that these differences are so apparent in starters originally prepared on the spot from pure cultures. They occur principally when a starter which has been in use for some time is taken from one particular class of country to another.

The dairying season of 1916–17 was in many respects an abnormal one. The heavy rainfall and excessive humidity were responsible for phenomenal activity over a wide range of plant life. Seeds which had lain dormant for years had their latent faculties quickened; and plants which had not been observed for years, and which it had been thought were extinct, made their appearance in many districts.

In the lower forms of plant life the same mystic agency was at work. Seeds or spores, which under ordinary circumstances had been dormant or had made very little growth, were started into activity; and coming unobserved and unannounced, their presence was not detected until some morning the cheesemaker found his starter in such a faulty condition as to be unfit for use. Only then was it realised that weeds had got into the crop.

The number of inquiries from cheesemakers having trouble with their starters was far in excess of previous experience, and one of the principal causes of trouble was "sliminess." This fault is frequently met with in cream, and is usually associated with swampy country ; but reports have come to hand of cream being received at the factory which was the produce of cows grazing exclusively on hill land, but which was distinctly slimy. This would indicate that in a wet season, at any rate, the organisms which cause "sliminess" can find a host on pastures where there are no swamps.

The principal difficulty in dealing with such occurrences lies in our inability to anticipate their presence or to checkmate their action. When once a starter has become slimy, it should be destroyed and a fresh one procured, and if the trouble is persistent it may be advisable to have the starter prepared away from the factory altogether.

Extra precautions should be taken when preparing a fresh starter. All cans and buckets, and everything used in connection with the starter, should be thoroughly steamed, and the milk procured from a fresh source and heated to a higher temperature than is usual under ordinary circumstances.

ANALYSIS OF ZAMIA PALM NUTS AND LEAVES.

SAMPLES of the above have recently been submitted to the Chemist's Branch of the Department of Agriculture for analysis, with the following results :—

	Kernel. per cent.	Leaves. per cent.
Moisture	81·79	76·67
Ash	1·07	0·99
Ether extract	0·18	0·21
Fibre	4·74	6·18
Albuminoids	0·03	2·64
Carbohydrates	12·19	13·31
	100·00	100·00
Calculated to dry substance—		
Ash	5·87	4·24
Ether extract	0·98	0·90
Fibre	26·02	26·48
Albuminoids	0·16	11·31
Carbohydrates	66·97	57·07
	100·00	100·00

Export of Butter to the United Kingdom.

IMPORTANCE OF MANUFACTURING CHOICEST QUALITY.

THE Imperial Government has purchased this season's surplus Australian butter, and it is proposed to retail it to the British consumer in a similar way to that adopted in the case of cheese, referred to in the last issue.

This means that the retailer will have to display in a prominent position in his shop a large placard advertising the country from which the butter came, as follows :—

GOVERNMENT BUTTER.
Price—
The produce of
NEW SOUTH WALES.

This method of distributing our butter is introduced for the first time, and gives Australia a splendid opportunity of establishing a reputation for its produce. It is most important that full advantage be taken of this chance. The name gained for the quality of butter (and cheese) exported this season must affect the sales of these products for a long time to come.

Last year, by various means, the butter manufacturers of New South Wales greatly uplifted the quality of their output, and this effort should be continued, the aim being not only to maintain the standard attained last year, but to reach a still higher level.

The British Government has fixed the purchase price for butter at 151s. per cwt. for that grading 90 points and over, with a shilling less for every point below 90. As soon as the Department of Agriculture became aware of the terms of this contract, representations were made urging an amendment to allow of 1s. *per cwt. extra being given for every point scored over* 90.

If the contract should remain as it stands there would be an inducement for factories to lower the quality of their butter, and make an average grade of a bare 90 points. Although this may give a present monetary gain, in the end it will be disastrous. Ninety-point butter, as is well known, is the lowest of the slightly tainted class—it is the border-line between low first grade and second grade. By deteriorating only one point it becomes a tainted butter. Under normal conditions it would be expected that, during the time elapsing between the date of grading and arrival at destination, 90-point butter would deteriorate several points, and become what in this country would be considered unfit for table use.

Under the conditions now prevailing, however, butter may have to be kept for months in cold storage before being shipped. Six months may elapse before it reaches London. It therefore becomes apparent that if we wish to gain a good name for our produce, it will be absolutely necessary to manufacture the very best quality possible; 43 points for flavour should be the minimum aimed at, inasmuch as for every point under that standard the risk becomes greater.

The Department of Agriculture, recognising the seriousness of the position, approached the Federal Government, who agreed to co-operate in the endeavour to prevail on the Imperial authorities in London to offer an extra inducement for the making of a butter of such quality as would be most likely on arrival at its destination to show little or no deterioration from choicest grade. With this object, cables have been despatched to the High Commissioner and this State's Agent-General. To further explain the necessity for some such action, as well as to demonstrate to the British Government the benefit to them in obtaining the best butter possible, the following facts obtained from the results of the 1916 Long Storage Butter Scheme, were given as follows:—

Results from Long Storage Butter, at temperatures about 5 degrees Fahrenheit, average length of time in storage 106 days. Put on market, July, 1916.

1,077 boxes (twenty-nine different lots), graded 93 points and over on entry into cold stores.

Four months after—

84·8 per cent.—913 boxes, graded 93 and over; choicest grade.
7·3 „ — 79 ,, „ 90 to 92; first grade.
7·9 ,, — 85 ,, „ 88 to 89; second grade.

Also, 7,309 boxes originally choicest quality (93 points).

37·5 per cent. regraded, after three to four months' storage, as choicest.

45·7 per cent. first grade;
equal to 83·2 per cent., fit for grocer's trade.

The balance, 16·8 per cent., were found to be second grade, and unsuitable for table use.

As against this, 11,881 boxes of butter that originally were of first grade (90 to 92 points), came out of storage as follows:—

49 per cent. first grade; 51 per cent. second grade.

These figures show the extent to which the quality of butter retrogressed from the time of being graded when going into storage, and when, on the average 106 days later, it was regraded prior to being distributed for consumption. It will be noticed that the higher the standard the better the keeping quality. For instance, butter on entry grading over 43 points for flavour was, at the end of the storage period, in nearly every instance of a quality suitable for table use, *i.e.*, good first grade, in many cases equal to when received; while on the other hand over 50 per cent. of that scoring, in the first place, 40 or 41 points, when regraded was found to have become tainted, being second grade and pastry quality—unfit for table use.

Danish butter on the English market in normal times always brings a considerably higher price than New Zealand. This in its turn is again fixed this year at 6s. per cwt. higher than Australian. These higher values are obtainable solely on account of the reputation gained for better quality; for consistently putting on the market for years past a choicest grade. Under ordinary conditions it would take years for us to build up such a trade name for our butter and cheese. Now, this ought to be effected during the next six months, *because our butter will be placed before the public as "New South Wales produce."*

In the keen competition that is sure to eventuate when peace is declared, a name for quality will be our best asset. For ordinary and inferior grades there is a probability of there being little demand. The British Ministry for food reports that, during the last eighteen months the manufacture of margarine in Britain has increased by 75 per cent., and a further 50 per cent. increase is looked for by next spring. Margarine is being purchased and consumed now by those who, previous to the war, did not know what it was to eat it. It is being found to be palatable and wholesome, and it will be most difficult to induce people to revert to the use of butter; possibly numbers never will. There should be, though, a market for the choicest article. This market will be limited to a smaller circle, and there is bound to be keen competition for it amongst dairying countries. In order to get our share the manufacturers of New South Wales must make good now, and strive to attain such a reputation in Britain for their produce as is now enjoyed by the Danes, and to a lesser extent by New Zealand. To do this will need the combined efforts of all concerned—the farmer must deliver to the factory a cream of the highest order—absolute cleanliness is an essential for doing this; cooling and aerating the cream as it comes from the separator will materially help.

The factory manager will need to grade most carefully—taking every possible care not to pack under a choicest brand butter that is unlikely to keep for a long period. One of the requirements of a good keeping butter is that it should have a good body and be well manufactured. For this it is necessary that care should be taken to see that low cream and water temperatures are the invariable rule in the churn room. The addition of pure culture starters to neutralised and pasteurised cream will materially aid in improving quality. These can be supplied free on application to the Department of Agriculture.

Any factory that has not yet taken steps to instal a pasteurising plant is strongly advised to do so without delay. It has been conclusively proved that it is the butter made from pasteurised untainted cream that does not go off in flavour when cold stored.

The Department of Agriculture, through its Dairy Branch, is willing to give any assistance in its power to aid in putting the industry on a better footing, and hopes to have the co-operation of all concerned towards that object.

A Basis of Cost in Wheat Production.

H. ROSS, Chief Inspector of Agriculture, and P. G. GILDER, Editor, *Agricultural Gazette.*

[Since this inquiry was started the writers have had access to an illuminating article on "The Determination of the Cost of Production of Farm Crops," by James Wyllie, B.Sc., N.D.A., in the British *Journal of the Board of Agriculture,* and considerable use has been made of many of the suggestions made by that writer.]

THERE is no subject associated with agriculture which has caused so much controversy in recent years as the cost of producing many of our main crops; and since wheat looms so largely in our export trade, and has become a factor in feeding less favoured portions of the Empire at a time when many of the usual avenues of trade are closed, the searchlight of public criticism has been focussed upon this problem. Second only in importance to "How to produce wheat" is "What does it cost to produce?" inasmuch as it matters little how much is grown if the operations are unprofitable. In any case a clear understanding of the basis on which the cost may be calculated will assist every wheatgrower, and a fuller knowledge may indicate directions in which economy may be practised or efficiency increased.

It has been well said that before any great progress can be made in uplifting agriculture to a more profitable basis, either by the individual or by organised farmers, every farmer must get down to facts and figures, and know his own business, not merely be content to surmise about it. As long as the farmer is content with an indefinite knowledge regarding his business, so long will other interests be content to profit by his weakness and construe the facts to suit themselves.

The problem may be handled from different points of view, but all of these are based upon certain unavoidable assumptions which must be tacitly agreed upon at the outset. Lack of uniformity in the acceptance of these assumptions accounts for some of the wide variations in estimate which were given in evidence before the recent Royal Commission of Inquiry on Rural interests, or which have appeared in the Press during the past few months.

A Basis of Calculation.

A unit or basis of calculation is also necessary, and one of the following may be selected.

1. *The farm basis.*—A farm of average size, capable of being conveniently worked by one man (with assistance at rush periods) may be taken as the unit, and its equipment in man, horse and machine power allowed for.

2. *The acre basis.*—This involves treating every acre separately after calculating the costs of all operations, supplies, use of land, &c.

3. *The yield basis.*—While it is the ultimate aim of all wheat farmers to ascertain the cost of producing a bushel of wheat, the problem is exceedingly difficult. The cost of producing a crop does not vary according to the yield, and with certain crops the cost will be very little more for a large than a small one. By introducing the yield we introduce a very variable factor, and this would give rise to misleading conclusions as to the economy and efficiency which had been exercised in production. The higher cost in some cases may be due to causes over which the farmer has no control, and not to any lack of skill in management. Comparisons on a yield basis are permissible and preferable only when made over a long period of years.

A Common Error.

One very misleading conclusion may be referred to here. Estimates are often made of the cost of the various operations in raising wheat, and these include the treatment usually given to the land by the most efficient farmers of the district. But as the set-off to this total cost is mentioned the *average yield* for the same district, which includes the results from areas which, owing to climatic, labour, or other conditions, have been cultivated in a somewhat indifferent manner. One very natural deduction from such a comparison would be that every wheat crop is taken off at a loss, whereas there is no doubt that many farmers have made and are making a satisfactory living from the pursuit.

A specimen of this will suffice to illustrate the point.

A Trundle farmer* estimates the cost of producing wheat on a 640-acre farm at £2 3s. 6½d. per acre, including carting to the station. This area is divided into 300 acres cropped, 300 acres fallowed, and 40 acres reserved for a horse paddock. Pickled and graded seed is sown, ½ cwt. of superphosphate is applied, and a team of ten horses used to thoroughly work the area. Thus with every advantage given to the crop, a yield of only 12 bushels per acre is allowed for. As the average for all parts of the State for the past ten years on land fallowed and unfallowed, properly cultivated and "scratched in," is over 11 bushels, the conclusion is misleading.

At meetings of Cowra and Tamworth farmers respectively, 15 bushels per acre was taken as a fair average return from fallowed land.

What must be included in Cost of Production.

It will be admitted that the cost of production includes at least—

1. All labour expenses (manual, horse and machine) of cultivation, seeding, manuring, harvesting, and transporting, either to where consumed on the farm or to where delivered for sale. The cost of labour must include the market value at current rates of wages of any work done by the farmer himself or any member of his family.

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* *Sydney Morning Herald*, 4th June, 1917.

2. The cost of seed, manures, &c., actually used in the production of the crop, and where the seed has been grown on the farm, a fair market rate must be allowed.
3. A proportionate share of the overhead expenses such as interest on capital, rent, rates and taxes, insurance, and general or establishment charges.

In the case of large concerns where a manager or overseer controls several farms, a proportion of his salary should be charged to each. This may be included under heading 3.

"To sum up the cost of production should be such a figure as will represent the minimum price at which a certain crop can be sold or otherwise realised to get (*a*) a fair return on his invested capital and (*b*) a reasonable remuneration as manager of the business."*

Average Cost of Production.

It is obvious then that it is quite impossible to assess, even within fairly wide limits, the cost of producing an acre of wheat on any particular farm without a complete knowledge of local conditions, as the cost will vary according to climate, soil, methods of clearing the land, lay-out of the farm, efficiency of the management and labour, facilities for agisting horses, and many other factors.

All that these notes attempt to do is to indicate certain lines on which the wheat farmer himself may, with as narrow a margin of error as possible, calculate the cost of production on his own farm.

Horse Cost.

Under Australian conditions of wheat culture, the horse cost is one of the important items of expenditure, though it is not often recognised as such. The use of multi-furrow ploughs, wide harrows, and 6 and 8-feet harvesters has rendered the employment of big teams of horses essential, and has materially reduced the cost of production. It is therefore necessary that an equitable method of assessing the daily value of the horse labour should be adopted. Any basis must provide for charging the crop with the actual cost without showing any profit or loss on the work-horse account itself.

But the problem is more difficult than it appears on the surface. As is often pointed out, the chief item in the production of horse labour is, of course, the cost of the horses' food, which is usually, and in the majority of cases most economically, grown on the farm, and is to some extent produced by horse labour. "Hence to attempt to show how the actual cost of both horse labour and crops may be determined would be to reason in a circle."*

The most obvious advice that is usually given is to charge all feed at its market value on the farm. In the case of grain this is comparatively simple, as it has an easily ascertained market value. With respect to the price of chaff, however, which is subject to wide variations at comparatively short intervals, the question increases in difficulty. On many farms where the production of chaff for market would be quite unprofitable, sufficient is stored for consumption on the property, and in such cases the farmer, in assessing the charge against the horse account, must approach the subject with a desire to be absolutely fair. It is only a book item after all, and any undue inflation of price deceives and affects no one but himself.

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* J. W. Wyllie.

Horse cost must depend upon—

1. Cost of feed while actually working.
2. Cost of agistment when not working (wet days, Sundays, &c.).
3. Value and consequent interest upon cost.
4. Depreciation.
5. A small but still appreciable allowance for contingencies, sickness, accidents, &c.

In assessing the value under items 2, 3, 4 and 5, the number of days when the teams will be working must be taken to account. This, on an ordinary wheat farm, depends upon climatic conditions, class of soil (how soon after rain the land can be worked), the general practice adopted (whether the land is fallowed, the amount of hay grown, &c.), whether the crop is carted by the farmer's own team, and the general efficiency of management. Taking an approximate figure only, it may be assumed that where wheat is the sole crop, and fallowing is practised, under average conditions teams will be worked about 210 days in the year. During the balance of the time they will be fed very lightly, or where paddocks are available, turned out to fend for themselves.

Methods of feeding vary considerably, and it is quite impossible to quote a cost which will apply to all cases, and to all types of horses. This is one instance in which each farmer must calculate for himself. The Trundle farmer already referred to quotes 3 cwt. of chaff per day for 10 horses, at a cost of 2s. 9d. per cwt. This is 33 lb. each, or about 10d. per day, a low estimate as compared with some others, which include grain in the ration.

Another estimate quotes 24 to 28 lb. of chaff and 8 lb. grain daily, with an occasional laxative of bran. This would increase the cost to 1s. 2d. or 1s. 3d. per day.

The value of horses of all ages on a wheat farm may be taken as approximating £30 per head, though there have been wide variations during recent years.

The annual cost under such conditions will therefore be somewhat as follows :—

	£	s.	d.
Feed for 210 working days, at say, 1s. 0d. per day ...	10	10	0
Agistment for remainder of year, seventeen weeks, at 1s.	0	17	0
10 per cent. depreciation on horse value	3	0	0
5 per cent. interest on horse value	1	10	0
Allowance for emergencies	2	10	0
Grooming and feeding, thirty-five weeks at 1s.	1	15	0
Total	£20	2	0

Based upon 210 working days in the year, the value of horse labour on a wheat farm where all or most of the feed is produced would therefore be about 1s. 11d. per day.

It is admitted that any such calculation involves several debatable assumptions, and practical farmers, as well as economists generally, might legitimately criticise many of the items. But no matter how accurate the recording may be, there is still room for widely varying opinions.

Labour Cost.

This is much more easily ascertained, provided that, as before-mentioned, when the work is carried out by the farmer or any member of his family, the same charge is made as if outside labour were employed.

Allowance may also have to be made where labour is retained throughout the year, and is less profitably utilised on wet days, &c.

For the purpose of this calculation, however, the value of a man's labour whilst fully employed in the production of wheat is placed at 10s. per day, with an increase to 13s. per day during harvesting operations. It must be understood, however, that these are merely nominal amounts, and in no way suggest that such should be paid in all or even in any circumstances.

Machine Cost.

In the following estimates interest on plant has been allowed at the rate of 5 per cent. on original cost, and depreciation at the rate of 10 per cent., while renewals on an average scale have been provided for. Under war conditions it is admitted that 5 per cent. is somewhat low, and in cases where the machinery is bought on the instalment system or where money has to be borrowed to pay for them, the actual interest should be charged.

Whether the 10 per cent. depreciation is sufficient to provide for replacements, very largely depends upon the care the plant receives, but it is a convenient figure to use, especially as it is the deduction allowed by the Taxation Commissioners.

It must also be admitted that machinery bought at the present time is costing considerably more than the pre-war figures, and this must increase to some extent the outlay of the farmer whose plant has been purchased recently. On the other hand, such a plant may be considered somewhat more efficient than the older machinery. Another set-off may be that while machinery has increased in cost, horses are somewhat lower in value than they have been for some years, and the total outlay has therefore not materially increased.

Time Necessary for Various Operations.

The time taken to perform the necessary operations in wheat growing varies in accordance with differing climatic, soil and other conditions. But at a conference of the Inspectors of Agriculture of the Department (supplemented by information supplied by the managers of the various experiment farms), it was decided to adopt the following as a fair average for the State for a working day of eight hours :—

Operation.	Number of horses used.	Acres per day.
Ploughing 6 inches deep with 4-furrow plough	6	4
„ 4 „ „	6	5
„ 4 „ „	5	4
Harrowing, 18 feet wide	6	40
Rolling, 10 feet wide	3	25
Disc cultivating, 5 feet wide	8	8
Spring-tooth cultivating, 9 feet wide	8	12
Skim ploughing, 6 feet wide	8	8
Drilling	4	15
Harvesting with combined harvester, 6-foot comb	6	10
Stripping, 6-foot comb	4	10

Cost of Various Operations.

Ploughing 6 *inches deep.*—The cost under these conditions will therefore probably be as follows :—

	£	s.	d.
Six horses at 1s. 11d. per day	0	11	6
Wages of man per day	0	10	0
Renewals, interest and depreciation (cost of plough, £40; depreciation, £4; interest, £2; renewals, £7. Total, £13 per annum). Approximate number of days used annually, say seventy—rate per day	0	3	9
	£1	5	3

At 4 acres per day, the cost is 6s. 4d. per acre.

It is of interest to note here that a calculation of ploughing 6 inches deep by traction engine was found to be 6s. 3½d. per acre.

Ploughing 4 *inches deep*—

	£	s.	d.
6 horses at 1s. 11d. per day	0	11	6
Wages	0	10	0
Renewals, &c., as before	0	3	9
	£1	5	3

At 5 acres a day the cost is 5s. 1d. per acre.

Harrowing with 18-*foot harrow*—

	£	s.	d.
6 horses at 1s. 11d. per day	0	11	6
Man	0	10	0
Renewals, interest and depreciation, say	0	2	0
	£1	3	6

Covering 40 acres per day, the cost is 7d. per acre.

If four horses only are used with a 12-foot harrow the cost would be—

	£	s.	d.
4 horses at 1s. 11d. per day	0	7	8
Man	0	10	0
Renewals, &c.	0	1	4
	£0	19	0

Covering 26 acres per day, the cost is 9d. per acre.

Harrowing is comparately simple work, and is often done by a boy. In this case the wage would be less, and the cost per acre correspondingly reduced.

Rolling—

	£	s.	d.
3 horses at 1s. 11d. per day	0	5	9
Man	0	10	0
Renewals, interest and depreciation, say	0	1	6
	£0	17	3

At 25 acres per day the cost is 8¼d. per acre.

Spring-tooth cultivating—

	£	s.	d
8 horses at 1s. 11d. per day	0	15	4
Man	0	10	0
Renewals, interest and depreciation, say	0	3	9
	£1	9	1

At 12 acres per day the cost is 2s. 5d. per acre.

Disc Cultivating—

	£	s.	d.
8 horses at 1s. 11d. per day	0	15	4
Man	0	10	0
Renewals, interest and depreciation, say	0	3	9
	£1	9	1

At 8 acres per day the cost is 3s. 8d. per acre.

Drilling—

	£	s.	d.
4 horses at 1s. 11d. per day	0	7	8
Man	0	10	0
Renewals, interest and depreciation, say	0	3	6
	£1	1	2

At 15 acres per day the cost is 1s. 5d. per acre.

Harvesting with combined Harvester—

	£	s.	d.
6 horses at 1s. 11d. per day	0	11	6
Man	0	13	0
Renewals, interest and depreciation (30 days' use per annum)	0	13	8
	£1	18	2

At 10 acres per day the cost is 3s. 10d. per acre.

Harvesting with Stripper—	£	s.	d.
4 horses at 1s. 11d. per day	0	7	8
Man	0	13	0
Renewals, interest and depreciation	0	9	6
	£	0	2

At 10 acres per day the cost is 3s. per acre.

Winnowing, where needed, is usually carried on at a cost of 2d. or 3d. per bushel.

Cutting with Reaper and Binder.—Where the climate renders it advisable, where a profitable market exists for the straw, or where hay is made for home use or for market, cutting with a reaper and binder is necessary, and the cost of taking off the crop will be considerably increased. Apart from cutting, the operations will include stooking, carting to stack, stacking, thrashing (when the crop is intended for grain), chaffcutting, &c. The cost of these operations is more difficult to assess because the data is not of such a generalised character.

As the machine is not likely to be used for many days in the year on the average wheat farm, except where the production of hay is one of the main objectives, depreciation and interest have a very definite bearing on the cost of the operation. Assuming the original cost of the machine to be £45, interest at 5 per cent. per annum would be £2 5s., and depreciation at 10 per cent. per annum £4 10s., and allowing a nominal figure of £2 per annum for renewals, a total annual charge of £8 15s. is the result. If this is spread over 30 acres in any one year, the cost is 5s. 10d. per acre; whereas if, say, 150 acres were cut, the cost for this item would be 1s. 2d. per acre plus a small additional charge for increased renewals and depreciation.

But it should be borne in mind that the reaper and binder is necessary on most farms for cutting headlands, tracks, fire-breaks, &c., and it is convenient to look upon it more in the light of a generally useful implement than merely for cutting a few acres for grain or hay.

The cost where only a few acres are cut will be :—	£	s.	d.
3 horses at 1s. 11d. per day	0	5	9
Man	0	13	0
Renewals, depreciation and interest	0	5	10
	£1	4	7

At 9 acres per day the cost is 2s. 9d. per acre.

Stooking is an operation the cost of which largely depends upon the nature of the crop, and an arbitrary figure of 2s. per acre, based upon the experience of the Inspectors of Agriculture, has been taken. This, like so many other figures, can only be ascertained by each individual farmer.

Carting to Stack and Stacking.—The same remarks apply to these operations, and no uniform charge can be fixed. A cost of 8s. per acre has been taken as the average cost for the purpose of this estimate, but in practice it may differ very widely from this owing to the distance from paddock to stack.

Thrashing is largely done by contract, rarely by the small farmer himself. The usual inclusive charge is 5d. per bushel.

Chaffcutting is also usually done by contract, and except on large farms this is the cheapest method. The cost (including steaming and the sewing of bags) is usually 12s. per ton.

Miscellaneous Costs.—There are, however, other inevitable items for labour which must be allowed for, but for which general figures only can be given. Additional assistance is necessary for sewing bags, stacking bags in paddock, ploughing fire-breaks round crop and stacks of bags, &c., while insurance of crop and insurance of workmen have to be allowed for.

Cost of Grading Seed and Pickling.

The cost of grading seed of course varies in accordance with the total amount handled per annum (affecting the interest and depreciation charges), and the amount treated per day (affecting the labour charge). Only on an exact knowledge of these two factors can a definite value be assigned, but an average charge of 4d. per bushel, based upon departmental experience, may be accepted.

The pickling of wheat has been found to require two men to treat about 100 bushels per day, and the average amount of bluestone used per bushel is 2 oz. Under normal conditions bluestone is worth about 3d. per lb., but the price has now risen to 9d. per lb. and upwards. The cost of the lime is trifling.

Apart from depreciation and interest on any machine that may be used, the cost will then be as follows :—

Two men at, say, 10s. per day, treating 100 bushels per day, or 2½d. per bushel; cost of bluestone at war rates, 1⅛d. per bushel. Under present conditions the total is nearly 4d. per bushel, while at pre-war rates this would be reduced to 3d.

Rental Value of Wheat Land.

This is essentially a matter for each individual farmer to assess for himself, and only an arbitrary value can be adopted for the purpose of these notes. Average wheat land within 6 or 7 miles of railway facilities can be taken as being worth £6 per acre. Outside this radius the tendency of values for land of similar quality would be to fall, but there would be a corresponding increase in the cost of cartage. On an average cartage cost of 1d. per bag per mile and a yield on fallowed land of, say, 18 bushels (or 6d. per acre for every mile cartage), for every additional mile from the railway land of the same quality would have a lower capital value of 5s. per acre, to return the same profit. On the other hand, land at a higher price would be likely to be nearer the railway (reducing the cartage cost), or of higher quality than the average.

Where fallowing is practised, two years' interest (or rent) would necessarily be charged to the one crop.

Other Considerations.

One possible set-off to the cost of producing wheat is the grazing value of the stubble and fallowed land. Undoubtedly the greatest profit in wheat growing is obtained when it is combined with the raising of wool and mutton, but it is exceedingly difficult to assign any value for this under all, or even average, conditions. It is safe to say that if the returns from the crop only covered all the items referred to as included in the cost of production, the grazing value of the paddocks would still leave an appreciable margin of profit. The estimate of the Cowra farmers already referred to assumes that the grazing makes up for supervision, insurance on plant and horses, and for discing fallow.

It must also be remembered that the rental value charged to the crops in most cases includes that of the house, and the farmer is thus living rent free, while all labour of himself and members of his family is allowed for at current market rates.

Operations Necessary in Producing Wheat.

These may vary according to class of soil, season, and in some cases the exigencies of other necessary work at a time most favourable to any particular operation.

Under average conditions, however, they would include :—

	£	s.	d.
6-inch ploughing	0	6	4
Harrowing three times at 7d.	0	1	9
Disc cultivating	0	3	8
Spring-tooth cultivating	0	2	5
Drilling	0	1	5
Graded seed, ¾ bushel at 6s.	0	4	6
Superphosphate, ½ cwt. at 6s. per cwt. landed on farm ...	0	3	0
Pickling seed at 4d. per bushel	0	0	3
Hail and fire insurance, say	0	1	6
Harvesting with harvester	0	3	10
Sewing bags, twine, stacking bags, &c., say	0	2	0
Rental value of land (two years)	0	12	0
	£2	2	8

All these items of cost are irrespective of the yield, but to deliver at railway the cost of bags and the cartage have to be added. Bags at present cost about

10s. per dozen landed at the farm, or 3⅓d. per bushel, while cartage is usually assessed at 1d. per bag per mile, or 2d. per bushel for 6 miles. Receiving charges at rail and freight to seaboard at present amount to 7d. per bushel but this of course is a war-time charge.

Cost of Production per Bushel.

This can only be ascertained on the actual yields of any particular farm. As already stated, misleading deductions are drawn when State averages are quoted, inasmuch as the low yields in some districts are due to unsuitability of soil or climate, or injudicious methods of farming. The average for the State for the past ten years has been about 11⅓ bushels, and it is safe to say that the average yield from typical wheat land on unfallowed land has been nearer 13 bushels. Departmental experience has shown that the return from fallowed land, well cultivated, sown with graded and pickled seed, and supplied with superphosphate, has been at least half as much again as the State average, and this would bring the average estimated yield from land so treated to at least 17 or 18 bushels per acre.

On the basis of £2 2s. 8d. to cover cost of production and rent, with an assumed 17-bushel yield, the cost per bushel is a fraction over 2s. 6d. Add to this 3⅓d. for bags, 2d. for cartage, and 7d. for receiving charges and freight, the cost at seaboard is 3s. 6½d. per bushel.

The following table will indicate the approximate cost per bushel based upon varying returns per acre, though there would be slightly increased charges in insurance, handling in the paddock, &c., for the higher yields.

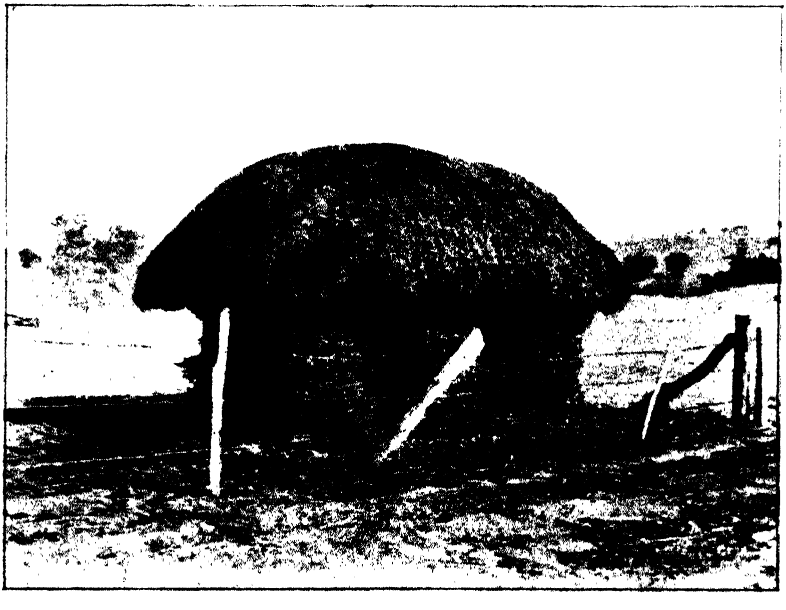
Yield per acre on fallowed land.	Production cost per bushel.	Bagging and cartage.	Cost landed at station.
bushel.	s. d.	d.	s. d.
12	3 6·6	5·3	4 0
13	3 3·4	5·3	3 8·7
14	3 0·6	5·3	3 6
15	2 10·1	5·3	3 3·4
16	2 8	5·3	3 1·3
17	2 6·1	5·3	2 11·4
18	2 4·4	5·3	2 9·7
19	2 3	5·3	2 8·3
20	2 1·6	5·3	2 7

.The wide disparity in these figures should be sufficient to show the difficulty of making any estimate of cost without a full knowledge of the facts in any particular case. But if it does nothing else, it should point out in unmistakable terms the undoubted advantages of increasing the yield in every possible way. It may safely be asserted that a reduction in the cost of producing a bushel of wheat under the labour-saving conditions prevailing in this State is less likely to be brought about by reducing the number of operations or increasing the area under cultivation than by the use of the most suitable varieties of seed, well graded and treated, the judicious use of fertiliser, and care in handling the crop during harvesting. There is a maximum beyond which the area covered by each implement used in wheat production cannot profitably be increased (though it is by no means safe to assume that such has yet been reached), but no one will set a limit to the possibilities of increasing production by means of improved varieties, adoption of better cultivation methods, and general efficiency of management.

(*To be continued.*)

PALATABILITY OF BOKHARA OR SWEET CLOVER.

In connection with the diversity of opinion as to the palatability of Bokhara or Sweet Clover (*Melilotus alba*) referred to in the article by the Agrostologist to the Department, and published in the October issue of the *Agricultural Gazette*, Mr. R. W. McDiarmid, Inspector of Agriculture for the North-west, reports that a stack of Sweet Clover was made by Mr. A. Sommerlad, of Hill Crest, Tenterfield, and was found to be very acceptable to the young dairy stock. As will be seen from the illustration, the base of the stack was eaten away by the calves in their eagerness, and Mr. Sommerlad is quite satisfied with the result of the trial.



Stack of Sweet Clover Hay on Mr. A. Summerlad's farm, Hill Crest, Tenterfield

Thousand-lb. Cows.

L. T. MacINNES, Acting Dairy Expert.

For some considerable time past much attention has been given by dairymen in the United States of America, to the production of high records in milk and butter-fat, over an extended lactation period, preferably of one year's duration. Prominent breeders of the various dairy breeds have vied with one another in these competitions. The result has drawn considerable attention to the capabilities of the dairy cow in the production of milk, and has acted as a stimulus to the breeding of high-producing animals. As long as constitution and type are not lost sight of, nothing but good should result.

Appreciating the benefits to be gained by advertising to the world that New South Wales dairy herds contained cows capable of producing over 1,000 lb. of butter in one lactation period of twelve months' duration, some years ago the then Minister for Agriculture—the Hon. W. G. Ashford—decided to offer £100 as a prize to the owner of the first pure-bred dairy cow which produced 1,000 lb. of butter in twelve months. The conditions attaching to the payment of this prize were :—

> That the butter calculations are to be made on the chart recently issued by the (late) Dairy Expert of the Department (Mr. M. A. O'Callaghan) which is now used for calculating the results under the United Pure-bred Dairy Cattle Breeders' Association ;
>
> That the prize is not to be given to any cow which does not produce a calf within eighteen months of the date of the commencement of the test, and that any cow which slips her calf is to be ineligible.

When the offer was made it was considered that years would elapse before the prize would be claimed, but the Department has been agreeably surprised to find that this year not one, but two cows have produced the requisite amount of butter in a twelve-months' testing period. It now remains to be seen whether either or both are able to comply with the other conditions relative to producing a live calf within the period stated. This early result of the Department's effort to assist the dairying industry is most satisfactory, proving as it does, that amongst our breeders there is no lack of progressiveness and ability, and that the strains of dairy stock established in this State are equal, from a productive point of view, to those found in the most advanced dairying countries in the world.

The testing of pure-bred stock for milk and butter-fat yields, as carried out by the Department of Agriculture on behalf of the United Pure-bred Cattle Breeders' Association of New South Wales, must have an incalculable benefit on the dairying industry. Bulls descended from these proved producing strains will be the sires of the future that should be in most demand by dairymen, and thereby be a means of uplifting the average production of our dairy herds.

Rules under which the Testing is conducted.

The testing of the cows competing for the prize offered by the Department was carried out in accordance with the rules of the United Pure-bred Dairy Cattle Breeders' Testing scheme, which are as follows :—

1. Breeders who are represented in this Association shall have their registered cattle, or those eligible for registration, submitted for testing under this scheme.

2. All registered cows in any herd submitted, except those covered by Rule 3, shall be tested unless some good reason is shown to the contrary, but it shall not be obligatory on the Department to test any herd submitting less than six cows. In the case of breeders not owning the required six pure-bred cows, any less number may be tested at the fees chargeable for the six.

3. Cows over ten years, or injured animals, may be exempt; the testing officer to be consulted before any animal is exempt.

4. A minimum charge of 5s. per cow tested, payable in advance, must be paid to the Department of Agriculture.

5. It shall be compulsory for members to have each cow in their herds tested for at least one lactation period.

6. The testing shall be done by an officer or officers appointed by the Department of Agriculture.

7. This officer shall visit each herd to be tested at least once a month, for the purpose of making the necessary tests. Not more than forty-eight hours' notice of the tester's visit shall be given.

8. Each test shall be over a period of twenty-four hours, and the milk shall be weighed and tested for butter-fat night and morning.

9. The officer shall see that all cows are milked out prior to test commencing.

10. The milk is to be weighed night and morning on approved scales, and the weight recorded on a printed chart supplied for the purpose. Particulars as to date of calving, services, nature of food fed during test, &c., are to be supplied to the official and published.

11. For purposes of record the lactation period shall be calculated as for 273 days, which shall be divided up into one period of 33 days and eight of 30 days.

12. The testing period for any cow can be extended to 365 days if requested by the owner. To complete the term of 365 days the last two periods shall be 31 days each.

13. In cases of cows it had been found impracticable to test until they had been calved for a period of two months or more, the tester be authorised, on receipt of a statutory declaration from the owner as to date of calving, to credit these cows' yields with two months' production based on the first twenty-four hours' test made by the official.

14. In the case of cows appearing to be in normal health, but testing abnormally owing to being out of condition at the time of the tester's visit, such tests shall not be registered, but an average made from the previous and succeeding tests. Any such sicknesses shall be noted by the official.

15. Every facility is to be afforded the testers in carrying out their duties in connection with the scheme, and accommodation to be provided over night if necessary.

16. The Department shall issue certificates endorsed by the Association, showing records of each cow that exceeds the standard of 200 lb. for the lactation period, in the case of cows 2 years old at the commencement of test, 250 lb. for 3 years old, and 300 lb. for 4 years old and over.

17. The breeding and records (both of commercial butter and butter-fat) of standard cows shall be published by the Department of Agriculture.

18. The official recorder shall be the Dairy Expert, Department of Agriculture.

19. The method of identification of certificated cows shall be by a tattoo mark inserted in the ear by the official; he at the same time shall register the brands and tattoos of the breeder carried by the animal.

20. The tester shall have power to test cross-bred cattle, the property of members submitting pure-breds, at the same fees provided that he is not unduly detained thereby.

21. The decision of the Council of the Association in any matter of dispute shall be final.

No. 7 of these rules provides that each test be carried out at least once a month. For purposes of record the year is divided into twelve portions as follows :—First period of 33 days, then nine periods each 30 days, the last two periods to be 31 days each. This makes a total of 365 days (Rule 12).

It is left to the Department's discretion when to visit each herd, provided a test is made every month. The itinerary is always arranged so that any overlapping in travelling shall be obviated as far as possible. The work of testing pure-bred cows under this scheme has taken up the full time of one official, and it has been a necessity to economise as much as practicable the hours spent in travelling, in order to get through his monthly round.

It must be remembered in connection with the tests made under the Pure Breeders' scheme, that the minimum number of cows which can be entered by any one owner is six, and it is further provided that the whole of the pure-bred members of the herd must be tested when ready.

There are thus often testing on the same day, cows entitled to the 33, 31, and 30 days monthly periods. The Darbalara Estate had, during the last twelve months, 35 cows testing at the one time. Under these circumstances it is impossible to allow the specified number of days to intervene between each test. Some cows calve just in time to hit the tester's visiting day; others just miss it and have to wait for the following month; so while the present system may give an advantage to some, to others it is the reverse. On the whole, however, the results work out with as much accuracy as can be expected from the present scheme, which is made to suit the requirements of the herd and not that of the individual cow.

Mr. MacDonald's herd was visited towards the latter part of a week—generally on a Friday. The testing of the Darbalara stock was arranged, as nearly as possible, to take place on the following Tuesday or Wednesday. Sometimes flood conditions, or disorganised railway transit, upset this time-table.

These breeders each had a cow competing—one representing the Jersey, the other the Milking Shorthorn. We will take the one that entered on the test first.

Brighton Vanilla II.

This cow, owned by Mr. C. R. G. MacDonald, Ingleburn, New South Wales, gave birth to a female calf on 31st October, 1916, and when the tester visited the farm on 17th November following, she was entered for testing for the usual 273-day period stipulated under the scheme. At the expiration of this period she had put up a record of 14,867½ lb. of milk, producing, as computed on the official chart, 808·83 lb. of butter. The owner then decided to extend the testing period to cover the twelve months, and compete for the Government prize. Up to that time Brighton Vanilla II had not been put to the bull, but on 4th August, 1917, she was served by Hecla's King, and on 14th August underwent her tenth test. She completed her twelve tests on 12th October, on which date her yield was as follows :—

> *Evening*—18 lb. milk testing 5·4 per cent., equal to ·972 lb. of butter-fat, or 1·15 lb. of butter.
>
> *Morning*—20½ lb. of milk testing 5·0 per cent., equal to 1·025 lb. butter-fat, or 1·21 lb. of butter.

The record put up for the whole 365 days was 18,197 lb. of milk, with an average test of 4·75 per cent., equal to 864 lb. of butter-fat, or by compututiou, 1,011·92 lb. of commercial butter.

Brighton Vanilla II had an advantage, in putting up this fine performance, of milking for 277 days before being put to the bull.

One of the conditions of the competition is that a live calf should be born within eighteen months after the date of the first test. If this rule had read, " Within eighteen months subsequent to the birth of the last calf " it would have made a difference of seventeen days, and Brighton Vanilla II would have been ineligible. As it is, she will be able, if she carries her calf the full average period, viz., to May, to calve within the time specified.

The following written statement has been received regarding the rations fed to Mr. MacDonald's cow during the testing period :—

> Brighton Vanilla II, in addition to natural pastures, was fed commercial foodstuffs, principally mill offal, purchased locally and in Sydney.

If further information comes to hand later, showing the details of the food fed to her, it will be published in the next issue of the *Gazette.*

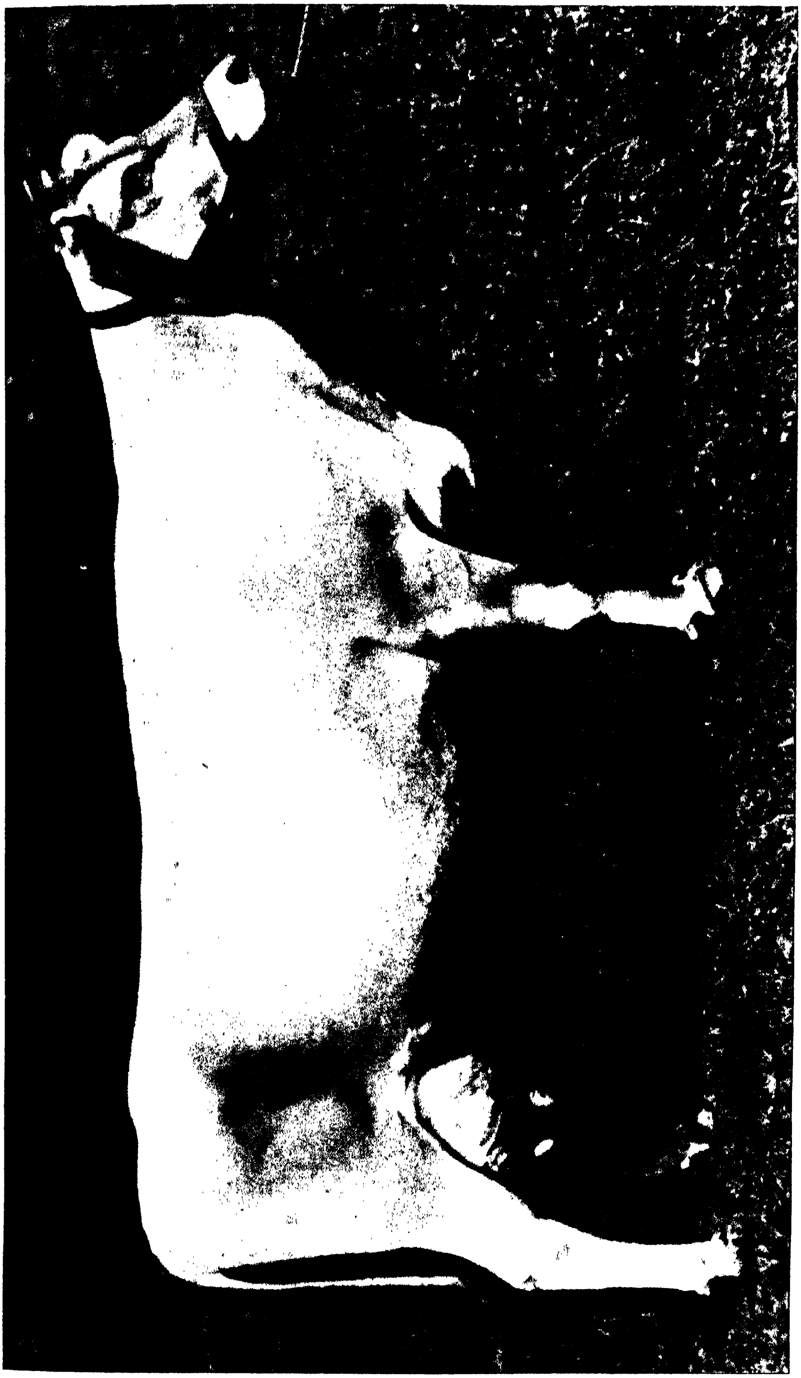


Photo by G. A. Hills.

The Jersey Cow, Brighton Vanilla II.

THOUSAND-LB. COWS.

PEDIGREE.

Brighton Vanilla II.—3078 Vol. IV, Jersey Stud Book of Australasia. Colour, whole ; calved 13th August, 1911.

Owned and bred by C. R. G. MacDonald, "Gordon," Ingleburn, New South Wales.

Sire : Hecla's King, 438.
Dam : Brighton Vanilla, 1676, by Dainty's King, 251.
g dam : Vanilla of Kameruka, 1444, by Magnet's Progress, 54.
g g dam : Lovely, by Jersey, 444 (imp.).
g g g dam : Lottie.

As a two-year-old, testing under the regulations of the United Breeders' Scheme, conducted by Government officials, she put up a record of 448 lb. of butter in 273 days—a most creditable performance.

As a three-year-old on her second calf, Brighton Vanilla II put up a record of 10,701 lb. of milk, producing 629 lb. of butter, winning the *Sydney Morning Herald* and *Sydney Mail* prize at the Royal Agricultural Society's Show in 1916.

At the expiration of her last testing period her age was 6 years 96 days.

Pedigree of Sire.—Hecla's King—Vol. III, Part 2, Jersey Stud Book of Australasia. Colour, silver fawn.

Bred and owned by C. R. G. MacDonald, "Gordon," Ingleburn, New South Wales.

Sire : Brighton King, 100 (imp.).
Dam : Hecla II, 1068, by Balaam, 356 (imp.).
g dam : Hecla, 92 (imp.) x Haronga (3357 E.H.B.).
g g dam : Patricia III x Orpheus (1178 E.H.B.).
g g g dam : Patricia x Romeo (700 E.H.B.).
g g g g dam : Portia x Welcome (933 E.H.B.).
g g g g g dam : Fleurie (859 F.S.C., E.H.B.).

Pedigree of Dam's Sire.—Dainty's King, Vol. II, Jersey Stud Book of Australasia. Colour, whole; calved 15th February, 1908.

Bred and owned by C. R. G. MacDonald, "Gordon," Ingleburn, New South Wales.

Sire : Brighton King (imp.), 100.
Dam : Dainty, by Young Champion.
g dam : Mr. Woodriff's Queenie.

Melba VII.

This cow is owned and bred by the Scottish-Australian Investment Company, Limited, on their Darbalara Estate, Gundagai, New South Wales. She gave birth to a male calf on 25th November, 1916, and was specially entered on a twelve months' test; the aim of the manager of the Estate (Mr. J. T. Cole) being to have a try for the thousand-lb. butter production record.

Milking Shorthorn Cow, Melba VII.

THOUSAND-LB. COWS.

The first test was taken on the morning and evening of 29th November, and thence every month to 16th October, 1917, when she produced on both evening and morning milkings, 17 lb. milk, testing 5 per cent., equal to ·85 lb. butter-fat, or 1 lb. butter; making a total of 34 lb. milk at 5 per cent. test—equal to 1·7 lb. butter-fat, or 2 lb. commercial butter for the day.

For the full period of 365 days she is credited with a yield of 17,364 lb. milk, 868 lb. butter-fat, or 1,021·59 lb. commercial butter, equal to an average test of 5 per cent. butter-fat.

Melba VII was served by Climax on 24th May, 1917, and is due to calve about 3rd March, 1918, so that during the last 188 days of her testing period she carried a calf; a handicap for which due allowance should be given.

Having won the *Sydney Morning Herald* and *Sydney Mail* prize for highest production, she had to be exhibited at the Royal Agricultural Society's Show, Sydney, in April, 1917, when in the middle of her testing period. This necessitated removal from her home quarters for two weeks, undergoing two long train journeys, and being subject to all the disturbance and excitement of the show ring.

The wonder is that all this did not affect her test for that month. It demonstrates her placid nature and quiet temperament.

Feeding Rations.

The Manager of the Darbalara Estate has made a sworn declaration regarding the food consumed by Melba VII during her lactation period, whilst undergoing the official test.

In addition to the natural pastures, she received :—

		£	s.	d.
1,389 lb.	oaten chaff, valued at	2	9	7
248 ,,	lucerne chaff, valued at	0	8	10
1,815 ,,	bran, valued at	4	10	9
541 ,,	pollard, valued at	1	11	6
1,985 ,,	crushed oats, valued at	6	18	7
183 ,,	maize (boiled), valued at	0	9	8
191 ,,	oil cake, valued at	1	5	7
	Total	£17	14	6

The natural pastures were very dry at the time the test commenced (November), and for the succeeding summer months. In March a slight growth of herbage took place, but this was checked and injured by flood-waters. Green maize was also fed for a short time, and when this became dry and frosted, the dry stalks were given as roughage. Commencing from June, crowfoot and other herbage began to grow in the paddocks. There was also a small area which contained, amongst other grasses, a good percentage of lucerne. On this Melba VII was grazed for one or two hours per day all the year round, except when it was submerged or suffering the after-effects of being flooded.

It might be mentioned here that, in fine weather, Melba VII was allowed out in the open during the daytime. During the last few months of the test she was housed at night and on wet days; prior to that, starting from about the latter part of March, she was rugged, and this was continued during the cold weather.

In working out a food ration, the individuality of the cow has to be considered—one that yields 5 gallons of milk per day requires more nutrition than one giving, say, 3 gallons. Climate also has an influence—in cold weather more food is required to keep up animal heat than in the hot season.

The standard daily ration recommended for America by Woll is :—

Dry matter, 24·31 lb., containing—

Protein	2·15 lb.
Carbohydrates	13·27 ,,
Fat	·74 ,,
Total	16·16 ,,
Nutritive ratio	1 : 6·9

Wolff-Lehmann states that, for a cow daily giving 27 lb. of milk, the ration should contain 3·3 lb. of protein, 13 lb. carbohydrates, ·8 lb. ether extract (fat); total nutritive substance, 18·2 lb.; total dry substance, 32 lb.; nutritive ratio 1 : 4·5.

Dr. Wolff states that, for a cow 1,000 lb weight in full milk, the following ration should be fed :—

Digestible protein	2·5 lb.
Digestible fat	0·4 ,,
Digestible carbohydrates	12·5 ,,
Total dry matter	24·0 ,,
Nutritive ratio	1 : 5·4.

Working out the ration fed to Melba VII on the analyses of similar classes of fodders made by the Chemist's Branch, Department of Agriculture, New South Wales, the average albuminoid ratio is found to correspond nearly to the standard American one (Woll).

PEDIGREE.

Copy of declared entry by the Scottish-Australian Investment Co., Ltd., to the Milking Shorthorn Association of New South Wales, for entry in Vol. IV, M.S.H.B. of N.S.W.

Name: Melba VII of Darbalara.
Colour: Red.
Calved: 30th October, 1910.
Bred by Scottish-Australian Investment Co., Ltd., Darbalara Estate.
Owned by Scottish-Australian Investment Co., Ltd., Darbalara Estate.

Pedigree.

	Name.	Colour.	Breeder's Name and Address.
Sire	Emblem of Darbalara; No. 100, Vol. II, M.S.H.B. of N.S.W.	Roan	S.A.I. Co., Ltd., Darbalara Estate, Gundagai.
Sire of Sire ...	Banker of Bolara; No. 5, Vol. I, M.S.H.B., N.S.W.	Roan	J. T. Cole, Kangaroo Valley.
Dam of Sire ...	Madame of Bolara; No. 406, Vol. I, M.S.H.B., N.S.W.	Roan	George Tait, "Oakdale," Kangaroo Valley.
Dam	Melba IV of Darbalara; No. 1576, Vol. III, M.S.H.B., N.S.W.	Red and white	S.A.I. Co., Ltd., Darbalara Estate, Gundagai.
Sire of Dam ...	Carbine	Red and white	do do
2nd Dam	Melba	Red and white	do do
Sire of 2nd Dam ...	Banker of Bolara; No. 5, Vol. I, M.S.H.B., N.S.W.	Roan	J. T. Cole, Kangaroo Valley.
3rd Dam	Madame; No. 406, Vol. I, M.S.H.B., N.S.W.	Roan	George Tait, Kangaroo Valley.
Sire of 3rd Dam ...	Heather; No. 27, Vol. I, M.S.H.B., N.S.W.	Roan	R. W. Moses, Myra Vale.
4th Dam	Podge	Roan	George Tait, Kangaroo Valley.
Sire of 4th Dam ...	Major V; g.g.g.g., son of Major (imp).	Roan	H. Nixon, Kangaroo Valley.

Sire of sire's pedigree :—

Banker, No. 5, Vol. I, M.S.H.B. of N.S.W., roan; calved January, 1898; bred by John Thomas Cole, of Kangaroo Valley; property of Scottish Australian Investment Co., of Bolara.

Sire, Victor (red), bred by James Parish, Kangaroo Valley; sire of sire, William (roan), bred by Andrew McGill, Albion Park; dam, Violet (roan), bred by Gabriel Timbs, Albion Park; sire of dam, a bull by Major II.

Previous records put up by Melba VII under official Government test :—

At two years of age, 8,095 lb. milk, producing 412 lb. butter, in 273 days on first calf.

At four years of age, 14,622 lb. milk, producing 678 lb. butter, in 273 days, and 16,899 lb. milk, producing 822 lb. butter, in 365 days.

(*To be continued.*)

Entomological Notes.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

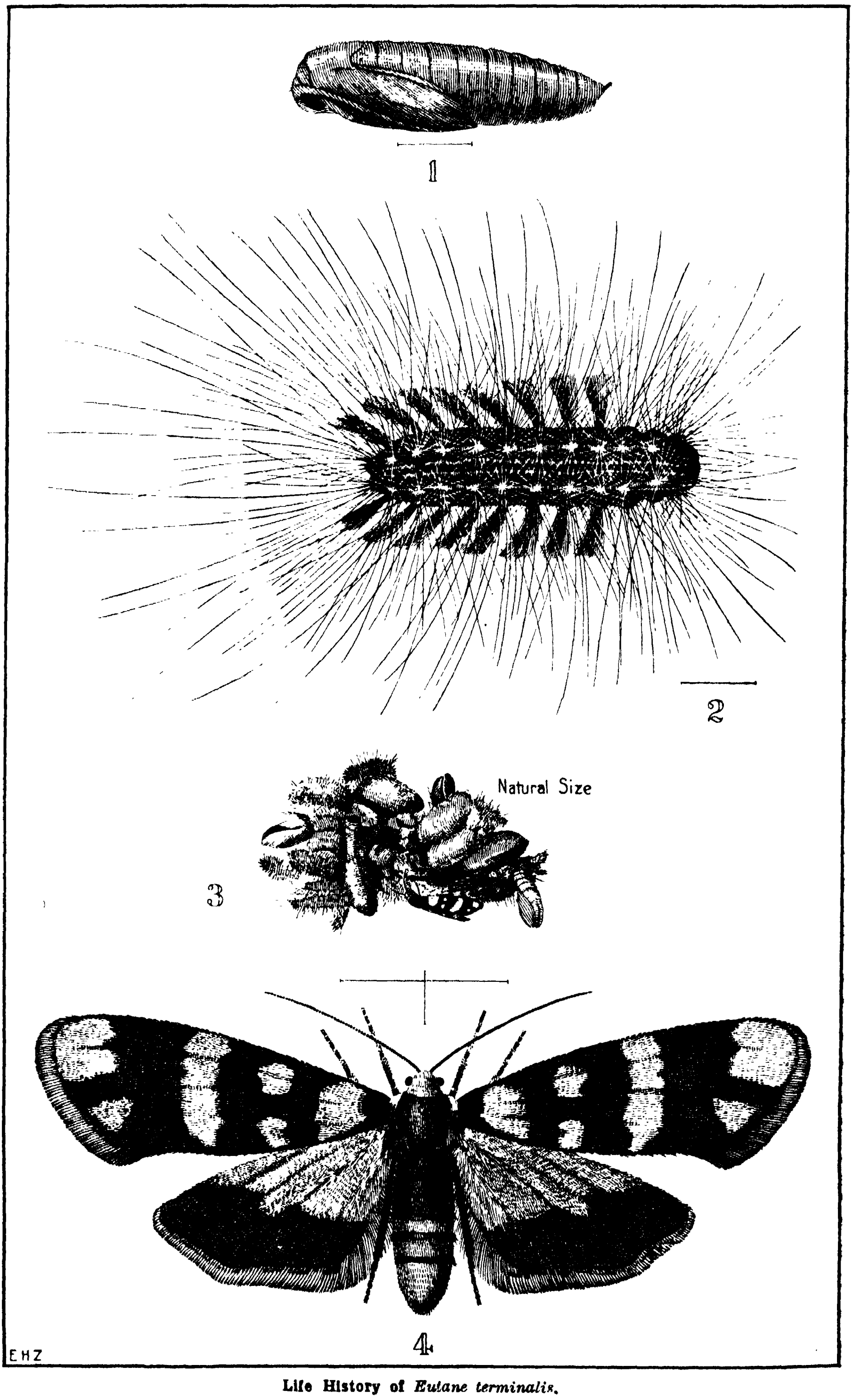
The Yellow-barred Grass Moth (*Eutane terminalis* Walker).

EARLY last March several householders reported that numbers of small hairy caterpillars were coming in off the grass, climbing up the walls of the house, and congregating on the woodwork of the roof above the ceilings. This curious invasion was observed at Hunter's Hill and several places on the North Shore of Sydney Harbour. Mr. Scutt, of Mosman, forwarded a number from his house with the statement that they were there in thousands, and he wanted to know if they would damage the woodwork. He was much relieved to know that their natural food was grass and herbage, and that they had simply taken up their quarters in the roof for shelter. The only trouble they might cause would be when the perfect moths emerged from the cocoons and perhaps found their way into the house, when the housekeeper might fancy they were a new kind of clothes-moth.

The caterpillars are handsome, greyish brown creatures, thickly clothed with tufts of hairs, interspersed with longer scattered hairs. The caterpillars when full grown, spin light brown loosely-felted cocoons of a more or less regular oval form, which are usually massed together and each contains a reddish-brown pupa.

The moth is somewhat variable in size; but usually measures under an inch across the outspread wings, and is a handsome variegated black and yellow creature. The ground colour is black with four irregular bands of bright yellow crossing the fore-wings, the first band near the shoulders irregular and rounded, the second band divided in the centre, forming a pair of spots, the third forming a narrow transverse bar, and the fourth or outer blotch extending over the tip of the fore-wing with a spot below. The hind wings have the basal portion yellow and the outer portion black. The head and apical portion of the abdominal segments are bright yellow, the rest dull black.

Mr. George Lyell, of Gisborne, Victoria, who has verified the determination of the specimens, informs me that he had considered this moth a rare one in Sydney, and that in the British Museum Catalogue, Sir George Hampson gives the known range from Maryborough, Queensland, to the neighbourhood of Sydney. The members of the genus are restricted, one other being described from Borneo. It belongs to the family *Arctiiadæ*, most of which feed upon grass and herbage in the caterpillar stage.

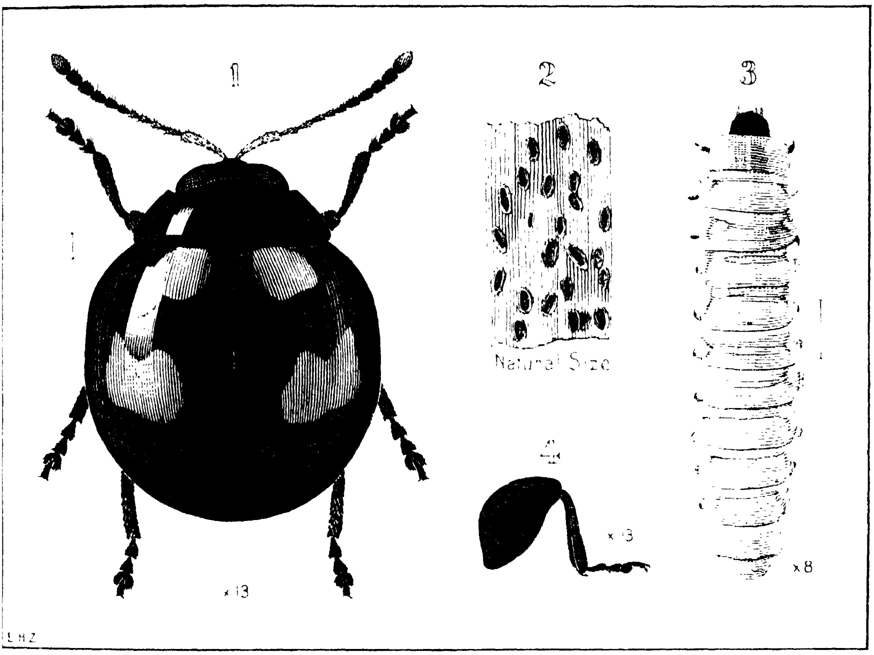


Life History of *Eutane terminalis*.

1. Pupa (enlarged). 2. Larva (enlarged). 3. Cocoons (natural size). 4. Moth (enlarged).

A Stag-horn Fern Pest (*Halticorcus platyceri* Lea).

Early this year, specimens of Stag-horn Fern fronds were brought to the Entomological Branch, so thickly pitted with small depressions on the upper surface that they were turning yellow and dying back. The specimens came from a garden at Hunter's Hill, and the owner said that many of his stag-horns were suffering from the pest, of which he had collected both the larvæ and perfect beetle. This beetle was not previously represented in our collection, so specimens were forwarded to Mr. A. M. Lea (Entomologist to the Adelaide Museum), who informed me that it was a new and undescribed species of Chrysomelid beetle, which he was describing under the scientific name of *Halticorcus platyceri.* The beetles lay their eggs upon the base of the fronds, and the slender reddish-yellow larvæ (with blackish head and legs) crawl over the surface of the stout fronds and gnaw regular oval furrows in the tissue. No pupæ were obtained, but the full-fed larvæ probably pupate about the base of the fronds.



Life History of *Halticorcus platyceri.*

1. Beetle, much enlarged.
2. Portion of fern frond showing damage by beetle.
3. Larva, much enlarged.
4. Hind leg, much enlarged.

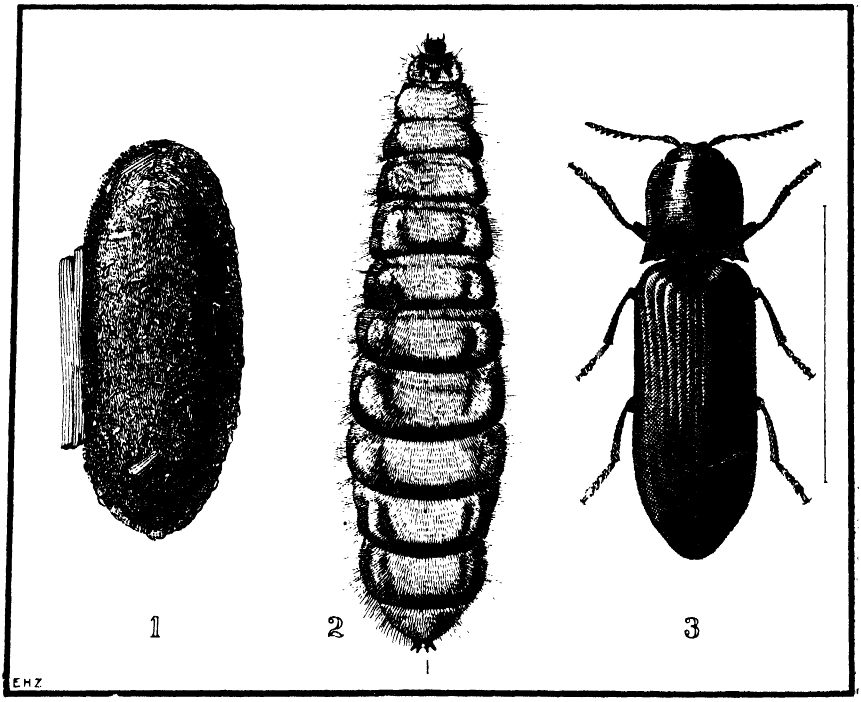
The perfect beetle viewed from above is blue-black, shining, with rich blue reflections, with the wing covers marked with four blotches of bright yellow, the front pair smaller and rounded, the hind pair larger, irregular, and arcuate on the front margin. The head, half hidden beneath the prothorax, is dark brown in colour, with large black eyes ; the long antennæ, with the apical segments thickened and clothed with fine grey hairs, are variegated yellow and black—the first five basal ones yellow, the following five black, with the terminal eleventh yellow. The under-surface of the body is yellow, with the legs black, the hind pair having the thighs thickened and adapted for jumping, on which account some species of the group are known as "flea beetles."

Though previously unknown, this pest may increase and become a common beetle upon the stag and elk horn ferns.

As they jump when disturbed, by jarring or shaking the ferns while holding a net or umbrella underneath, the perfect beetles might be collected and destroyed. A tobacco and soap spray would kill them in the larval state.

A Remarkable Click Beetle (*Tetralobius fortnumi* Hope).

Some years ago the writer discovered a very remarkable-looking beetle larva while breaking up a dead log at National Park; later on specimens were found in similar situations in the Uralla district, but none of them reached the pupal state. Last year several fine specimens of the same curious larvæ were received from Mr. George Turner, schoolmaster at Tilpa, near Bourke, with a request that they might be identified.



Life History of *Tetralobius fortnumi.*

1. Pupal cocoon. 2. Larva. 3. Beetle.

These specimens were evidently full-fed, for both of them pupated and the adult beetle obtained, after remaining for about three months in the pupal state.

The larva is dull yellow to light brown in tint, with the whole body thickly clothed with long, fine reddish-brown hairs; the head, mouth parts, and pronged process on the last abdominal segment are black.

The head is small, rounded in front, flattened and finely granulated on the upper surface, with short two-jointed antennæ springing upwards like a pair of short horns, and a little raised blister on the top of the head above the antennæ. The mouth parts are hidden when viewed from above, with only the short stiff palpi standing out beyond the front margin. The thorax is composed of three narrow segments, the first longer than the following two, with deep segmental divisions; the legs are well developed, stout, rather long, and each terminating in a fine black claw. The abdominal segments, nine in number, are deeply segmented and broadening out to the rounded anal tip; upon the summit of the last segment there is produced a shining black chitinous process, from which project a pair of two-pronged forks, turning outward, away from each other, at the tips.

These larvæ are very active creatures, crawling along very quickly, and extending and contracting the body as they progress. The larvæ of the common "click beetles" are known as "wire worms" on account of their slender circular form and shining brown chitinous skin, quite unlike this curious form. There are a number of species of these click beetles in the inland districts, that are usually found hiding in the rough bark of she-oaks, beef-woods, and other scrub trees.

The larvæ, when placed in a box, constructed an oval cocoon of blackish-brown secretion like papier-maché, thin and brittle, under the shelter of which they underwent their transformation to the perfect beetles.

The adult beetle is of a uniform dark brown colour, with pectinate antennæ, large rounded head and thorax, with long slightly striate wing-covers rounded at the tips. It measures 1½ inches in length, and is of a uniform breadth.

PIGS AND THEIR MANAGEMENT.

THE second edition of "Pigs and their Management," by Mr. H. W. Potts, F.C.S., F.L.S., Principal of the Hawkesbury Agricultural College, published in February last, has been exhausted and a fresh issue, in paper boards, is now on sale at the Government Printing Office, Sydney, at 3s. 6d. (postage, 2d. extra). That the publication early in the year was particularly opportune is sufficiently proved by the necessity for the present announcement, while the representative character of the demand for information on the subject is proved by the inquiries received from every State in the Commonwealth.

Poultry Notes.

DECEMBER.

JAMES HADLINGTON, Poultry Expert.

Increased Accommodation.

PROVISION for the housing of pullets from the recent hatching season will now claim attention, particularly where an increase of stock has to be provided for.

Even in normal times the problem of providing ample accommodation to meet the necessities of the increasing stock is a severe tax on the slender resources of many poultry keepers, but at the present time, owing to the high prices of building materials, and the difficulty of securing iron, a severe handicap is being experienced. But notwithstanding this, it is a circumstance worthy of note that the class of poultry buildings being erected at the present time is much in advance of any previous period in the history of poultry keeping in this State. This points to the increased importance now being attached to the poultry industry. Nevertheless, the fact remains that most poultry farms are still more or less congested in this respect. There is, too, a somewhat general lack of knowledge on the matter of what constitutes adequate housing for a given number of birds.

In addition to the cases of this kind that come under observation, a good deal of inquiry is received on this subject, and as this is the time of the year when the necessity for more housing accommodation is beginning to be felt, some information on this matter will doubtless be of service.

Having regard to reasonable run-space, the housing accommodation becomes the determining factor in the carrying capacity of the farm, and failure to provide ample, well ventilated buildings is a frequent cause of sickness, and also of unsatisfactory results in regard to egg production. We cannot secure the latter without healthy hens, and we cannot have healthy fowls without ample provision for fresh air, no matter how we may treat them otherwise. Poultry are said to use up more oxygen proportionate to their size then any other living thing, but the general tendency is to house them under conditions that allow of less than a sufficient amount being available.

Systems of Housing.

Generally speaking, the housing of adult poultry may be divided into two main systems—(*a*) roosting room only; (*b*) roosting room accommodation plus a portion of the house devoted to scratching material.

For roosting room only the long narrow shed is probably the best, that is to say, a shed 6 to 8 feet wide, carrying two or three roosts respectively, running the whole length of the building. Such a shed no matter what its length, should be at least 5 feet high at the back, and 6 feet at the front. The house in which the scratching-shed principle is to be a feature will need to be 14 to 16 feet wide, by whatever length desired, determined, of course, by the number of birds to be accommodated. Such a building will require to be somewhat higher than the other, and should be at least 6 feet high at the back and 8 feet at the front. Both classes of house should either be open-fronted or covered with wire netting in front, and should face the north.

The measurement in both systems is on the assumption of iron roofs, especially in regard to the height of the back, but if the roof is of other materials it might be necessary to give more "pitch" to the roof, which will necessitate carrying the front higher.

A consideration in regard to open-fronted sheds is that when the length is over 20 feet, it is advisable to put in partitions. Thus, if a shed is 60 feet long, a partition should be put in at every 20 feet; in the case of the narrow shed the whole width of the building, while in the wide shed half the width of the building will be sufficient. This is for the purpose of breaking the draught caused by the wind entering in at one end of the shed and sweeping the whole length of it. In either case it is not sufficient that the front of the house be open; in addition an aperture, at least 4 inches wide, should be left under the back eaves of the roof to allow the passage of air through the building. Even an open-fronted shed is not ventilated unless there is such an opening.

As already mentioned in the case of the narrow sheds, two or three perches should run the whole length, while in the case of the wide one, about 6 feet will be devoted to roosting accommodation—at the back for preference—and the front portion given up to scratching litter. A board about 12 inches high running the whole length of the building is necessary to divide the scratching material from the roosting quarters, the latter being simply sanded over to keep the excreta from adhering to the floor.

Some poultry-farmers prefer to use dropping boards under the perches; these are placed under the roosts in such a manner as to catch all droppings. But there are some objections to this system, particularly where large numbers are to be run in one house. One objection is that the dropping board necessitates putting the roosts somewhat too close together, and when three or more roosts have to be put in, the dropping board is of such a width as to form a wide platform which the attendant must climb over in his work of manipulating his stock. Another objection is that when hens have to be caught at night, the whole flock are likely to be disturbed from the perches, get down on to the floor and under the platform formed by the dropping board, and stay there in a mass for the remainder of the night. Such an occurrence is conducive to an outbreak of roup, and at any rate is certainly injurious to the health of the flock.

Size of Poultry Houses

Considerable risk from disease is run when large numbers of growing stock, between the ages of twelve weeks and six months, are housed in one building. Birds of this age are best handled in flocks of not more than fifty head.

From six months onwards they may be run as adults, in which case the following approximate sizes of house may be recommended, varying slightly one way or the other, in accordance with the breed to be housed :—

APPROXIMATE Dimensions of Houses for various numbers of Hens.

No. of Hens.	Roosting Houses only.					Combined Roosting and Scratching Houses.				
	Length.	Width.	Height at front.	Height at back.	No. of Roosts.	Length	Width.	Height at front.	Height at back.	No. of Roosts.
	ft.	ft.	ft.	ft.		ft.	ft.	ft.	ft.	
10	6	5	6	5	2	12*	5	6	5	2
20	7	6	6	5	2	14*	6	6	5	2
30	10	6	6	5	2	18*	6	6	5	2
50	15	6	6	5	2	22*	8	6	5	3
100	30	6	6	5	2	16	14	8	6	4
150-200	30	8	6	5	3	22	14	8	6	4
200-250	40	8	6	5	3	28-30	14	8	6	4

* In these cases the partition board between roosting space and scratching area should halve the length of the house, and the scratching area should be boarded up to within 12 inches of the front of the roof to prevent the effects of the weather on the material.

Materials for Housing.

As far as roofing is concerned, it is not intended to advocate any special material other than galvanised iron, which is, undoubtedly, the best if procurable. At the same time, it might be stated that tiles appear to work out as cheap, and probably in some cases cheaper than iron, when procurable within easy distance. But it should be understood that tiles will require stronger timber to carry them than in the case of iron, also it will be necessary in cases where tiles are used to give more pitch to the roof.

As regards the walls of poultry houses, probably the cheapest material of a permanent character at the present time is sawn palings on the lap-and-space principle. The life of such a wall, when properly built, is from twenty to thirty years, and practically no maintenance is necessary, nor do they require painting. This in itself is an economical consideration.

At present Sydney prices for 5-feet palings, 100 feet of wall 5 feet high, including wall plates, floor plates, and studding of 3 in. x 2 in., together with a centre stringer of 3 in. x 1 in. batten, cost £6 8s. for materials. This is allowing studding to be spaced every 8 feet, which is all that is necessary in such a wall. The cost of a 6-foot wall of similar construction would be £6 15s., while that of a 7-foot wall of the same material about £7. This works out that walls of a house 5 feet high, for 100 adult stock would cost £1 12s., for the same wall 6 feet high, £1 13s., and 7 feet high £1 15s. plus freight. This is for houses of roosting room only. When the permanence of these walls is taken into consideration, it is questionable if any other material can compare with it in point of cost.

Perches.

In poultry houses up to 8 feet long, 3 in. x 1 in. hardwood battens are all that is required to form perches, but over that length 3 in. x 2 in. hardwood becomes necessary. Both can be used in the rough, as they come from the mill, but there is no objection to chamfering off the raw edges. It is, however, a mistake to plane perches to make them smooth. It is sometimes argued that a round perch is more natural for the birds to roost upon, but the fact that a round perch such as occurs in nature is covered with bark into which the birds can get a grip, is not taken into consideration; while in the case of the round perch which is used under domestic poultry-keeping conditions, the bark cannot be retained on account of its harbouring vermin. Such round perches become smooth and cannot be gripped by the bird in such a manner as to give stability so that the birds can be at rest.

BEE-KEEPING ON THE MOUNTAINS.

IN reply to a question as to the prospects of profitable bee-keeping in the neighbourhood of Wentworth Falls, on the Blue Mountains, Mr. R. G. Warry, Apicultural Expert, wrote :—

"Small apiaries of from twenty-five to thirty colonies of bees can be made to pay on the Blue Mountains, but the quantity of honey obtained per colony each year will not be equal to that of the best bee-keeping districts. Taking an average from the yields of colonies on the mountains for the past eight years, from £1 to £1 2s. 6d. per colony can be obtained when careful attention is given. A site with an easterly aspect, protected from driving rain and cold winds, should be selected for the apiary. At Wentworth Falls the season will be comparatively short, and every provision must be made to carry colonies through a severe winter, and they cannot be expected to build up until late in the spring. The first nectar of the season will be gathered from fruit bloom, but this will be used for breeding and none will be available for the extractor. In October of every alternate year turpentine trees bloom, giving a fair quantity of light honey. There are practically no trees of any value from a honey point of view which can be said to bloom annually, most of them flowering every other year; while others, such as stringybark, are very uncertain, remaining in bud for many months before coming into flower.

"The timber from which most honey can be expected is blackbutt, which yields a good quality of light honey, flowering very irregularly. Red bloodwood, which blooms in February and March of every alternate year, gives a good quality of amber-coloured honey, which granulates quickly. Grey gum and cabbage or dwarf gum both yield fair quantities of good honey, but their times of flowering depend very largely upon rainfall. On the whole, the locality is not one where a bee-keeper would choose to make a living from his hives; but provided the timber is not excessively damaged by bush fires, small apiaries situated at least 2 miles from each other, can be made to pay as side lines."

Agricultural Bureau of New South Wales.

SINCE the commencement of this movement in 1911 highly satisfactory progress has been made, as will be observed on reference to the long list of country branches, and on perusal of the notes of meetings of the various branches published herein from time to time.

The main objects of this organisation are to impart agricultural education to farmers by means of lectures and demonstrations by departmental officers, and to encourage farmers to assist one another by gathering together regularly and exchanging their ideas and experiences, principally as regards local conditions, and, of course, regarding agriculture generally.

Farmers are invited to join the local branch, and can do so by getting into touch with its honorary secretary.

In districts where no branch exists, farmers are asked to co-operate with the Department in endeavouring to establish a branch. Full particulars regarding the usual method of procedure, &c., will be furnished on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Notice to Honorary Secretaries.

It is important that regular monthly meetings should be held, and that a record of the meetings of the branches should be inserted in the *Agricultural Gazette.* Honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 14th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of the common insect pests of the district, and collections are cased as required. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Sheaves of Grasses.—The Department is prepared to supply to branches of the Bureau which make application through their secretaries, collections of sheaves of grasses considered suitable for the respective local conditions.

Formation of Libraries.—It is suggested that each branch should arrange to establish a library for the use of members; it is thought that this would be a capital way of expending surplus funds.

Secretaries of any branches which may decide to form a complete library are invited to communicate with the Department in the matter, and they will be furnished with an appropriate list of standard works.

Each branch when formed is supplied with a set of available *Farmers' Bulletins*, and from time to time new bulletins are sent to the secretaries for addition to the files. In addition to this, individual members can also procure copies of any bulletin or publication that may be of interest to them in their particular branch of rural industry, by applying for the same through the secretary of the local branch.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse all the opinions expressed.

Bankstown.

A meeting was held on 22nd October, at which Miss Brace, Secretary of the Women's Horticultural Association, gave a lecture on intensive culture in home gardens. About forty persons were present, and a small rose show was held, which promoted a considerable amount of enthusiasm.

Bimbaya.

The monthly meeting was held on 4th October, when a variety of matters was discussed. Mr. E. T. Boller drew attention to the method of obtaining books on loan from the Public Library, Sydney, and urged members to take advantage of the system.

Mr. J. R. Boller read a paper on the rearing of calves, in which he remarked that the high prices now ruling for stock of all kinds made it incumbent on every dairy farmer to give his calves every care. He advocated the use of hardy stock, and cleanliness in all feeding and stabling arrangements. Some of the calf foods on the market were regarded as of assistance in rearing, and so also were small paddocks of lucerne, oats, &c. A few shade trees were valuable, as calves could not stand excessive heat; water should always be available. "White scour" could only be avoided by attention to the feed. Lungworm could be most successfully treated by making the animals inhale sulphur fumes, and stomach worms by administering a little turpentine in warm milk. Calf paddocks and pens should be treated with lime.

Cordeaux-Goondarin.

The usual monthly meeting of this branch was held at Mr. T. MacNamara's property on 3rd October. Fifteen members were present, which in the scattered nature of the district is an excellent muster, many having to come at least five miles to be present.

The usual business having been transacted, a motion was passed that correspondence be initiated as to the use of fruit cases for purposes other than that for which they were primarily made. It was felt that a great injustice was done to orchardists, the present price of cases being so high. In the district, fishermen, who are not confined to any standard case, buy the fruit cases second-hand, branded or otherwise, and so unduly inflate the price of cases, should the orchardist desire to re-purchase standard cases that have been used. In the adjourned discussion of Mr. MacNamara's paper on scale insects and spraying, most of those present took part.

A very interesting letter, describing the soldier's life on a troopship, was received from the late Secretary of the branch, Mr. F. A. March, who is now on his way to the front.

A paper was promised by Mr. Albert Fishlock on potato growing for the next meeting, which is to be held at Mr. Edward Gilchrist's, Kembla Vale.

Cotta Walla.

A paper on the weed fat-hen in potato crops was read by Mr. S. E. Butt, at a meeting held on 2nd October. Mr. Butt considered it the worst weed potato growers had to contend with. Owing to its vigorous growth, and habit of germinating in the spring, it soon grew higher than the crop and robbed it of moisture, air and space. The best way to destroy it was to harrow the land several times as soon as the weeds showed above the surface; it was then in a very tender state, and could be easily killed. The harrow was useless after the weed had been growing a couple of weeks, and the horse-hoe or scuffler was then the best implement for working between the rows, while hand pulling was necessary between the plants. If the weeds got too forward for the scuffler, the only thing was to pull them out by hand, and, if the seed had formed, it was well to burn the plants.

DEPARTMENTAL NOTE.—The Chief Inspector remarks that fat-hen (*Chenopodium album*) is a very undesirable weed in cultivation paddocks as, if allowed to go to seed, it will soon infest the whole paddock, each plant producing an enormous quantity of seeds. It is a gross feeder, and will rob a potato crop of much plant food and moisture.

The following is a summary of a paper by Mr. W. E. Howard, which was also read at this meeting :—

RABBIT EXTERMINATION.

No landowner knows the damage rabbits do until he has cleared them off a portion of his holding, and compares it with another portion infested with rabbits. He will then realise that the whole property should be cleared of the pest.

The first work to undertake is to erect a wire-netting fence round the farm or paddock. If only one or two men are to be employed in digging out, the area enclosed should not be larger than 200 or 300 acres; of course, if a gang of men are hired, much larger areas can be handled. The next step is to destroy all rabbit harbour by digging out the burrows and burning hollow logs. The most suitable tools for digging the burrows are mattock and spade. When the burrows go deep, the spade or shovel is needed to take the surface earth away. In this way it is easy to keep trace of the burrow. Care should be taken not to miss forks or wings. I consider it a good plan to fill the burrows level again, after digging out. The pick and axe are also handy tools, the pick for stony land and the axe for chopping the rabbits out of logs and trees. When all harbours have been destroyed, the land should be well scoured with dogs to catch any outsiders. The best breeds for this purpose are kangaroo dogs, collies, and fox terriers.

The best time of the year to clear them off is July and August, because all the rabbits are saleable, and the ground is in good working order.

The usual price for digging out is 3s. to 4s. per acre; but if the land is free from rabbits it is worth at least £2 per acre more than if it is infested with them.

Even after land has been thoroughly cleared of rabbits, it must be closely watched and kept free. Fences often become damaged by cattle and by falling trees, gates may sag and warp, and flood-gates often get propped open with wood during storms and do not return to their proper places. Under any of these circumstances rabbits will swarm back on to the land from adjoining infested land, and if they are allowed to obtain a footing, the process will have to be repeated.

DISCUSSION.—It was unanimously decided that digging out was the best and sures means of getting rid of rabbits. A diversity of opinion was expressed as to the merit of filling the burrows level, some members holding that rabbits would burrow them out again, whereas if left open they would be untouched. On the other hand, it was stated that if left open there would be a loss of lambs every year, and to fill in at a later period meant added expense.

Coobang.

A meeting of the above branch was held at Mr. L. A. Symonds' on 6th August, when a useful discussion took place on the cost of growing a bushel of wheat. Mr. J. Donaldson presented a set of figures, which was carefully considered, and finally the following estimates were agreed to by the meeting:—

ESTIMATED COST OF PRODUCING WHEAT.

	s.	d.	
Ploughing	7	0	per acre.
Keep of horses when not working	1	0	,,
Harrowing	1	0	,,
Seed	4	0	,,
Manure	3	0	,,
Drilling	2	3	,,
Bluestoning	0	3	,,
Insurance	1	0	,,
Harvesting	7	6	,,
Bags	4	6	,,
Cartage	4	2	,,
Twine and sewing	0	7½	,,
Rent of land	6	0	,,
Depreciation on plant worth £400	3	2	,,
Interest on plant	1	7	,,
Freight and commission	8	0	,,
	£2 15	0½	,,

At a meeting held on 1st October, a magazine article on mixed farming and fodder growing was read by Mr. H. E. Drabsch, Hon. Secretary, and provoked a conversation that was regarded as helpful. Members generally were in favour of growing a quick-maturing variety of wheat in combination with rape for local requirements. The residues could be ploughed in at the end of the season.

Two new members were elected.

Garra-Pinecliff.

Under the auspices of this branch a milk-testing demonstration was carried out at the residence of Mr. H. Robards on 25th October, the operators being Messrs. A. S. Blackwood and S. W. Packham. In all, the milk of about forty-six cows was tested, with very satisfactory results, some of which are detailed as follows :—

Ten cows owned by Mr. H. Robards tested from 3·0 up to 6·6 per cent. The morning's milk from the ten cows mixed tested 4·2, and the night's milk 4·6.

Mr. H. W. Bradley had nine cows tested, the lowest cow giving a 3·2 test and the highest 6·0. The morning's milk from the nine cows mixed tested 4·8.

Mr. S. W. Packham had nine cows tested, the lowest test being 4·0 and the highest 5·0. The average was 4·3.

Mr. A. G. Sear had two cows tested, one yielding 4·0 and the other 5·0.

Messrs. P. Rubie and P. Staines also had a number of cows tested, with highly satisfactory results.

After the testing, the party was hospitably entertained at tea by Mrs. H. Robards, and the annual meeting of the branch followed. The election of officers resulted thus:—Chairman, Mr. P. Rubie; Vice-Chairman, Mr. H. Robards; Treasurer, Mr. S. Robards; Hon. Secretary, Mr. S. W. Packham. The report and balance-sheet showed that the branch had had an active year, and that its financial position was satisfactory.

Glenorie.

A meeting of this branch was held on 29th September, when the following officers were elected: Chairman, Mr. F. A. Nicholson; Hon. Secretary and Treasurer, Mr. J. Hutchinson.

After the general business of the branch had been transacted, Mr. F. A. Nicholson related his experiences in regard to the winter spraying of apples with red oil emulsion. He stated that trees sprayed were fully a week, and in some cases a fortnight ahead of those not so treated.

DEPARTMENTAL NOTE.—The Fruit Expert remarks that it has been noticed in the Department's and other orchards that spraying with oil hastens the blossoming.

A meeting was held on 27th October, when discussion took place on the prospects of disposing of the coming summer fruit crop.

Inverell.

A lecture was given on 4th September under the auspices of the above branch by Mr. H. Wenholz, B.Sc. (Agr.), Inspector of Agriculture. Mr. J. Ditzell presided.

MAIZE CULTURE.

Mr. Wenholz referred to the great susceptibility of maize to climatic conditions. Tests carried out at Inverell had shown that acclimatised seed gave a yield of 4 bushels per acre above that from outside sources. The Department had of late years been experimenting with varieties grown by farmers in certain districts, and not known outside those localities. These were being tested alongside of standard varieties recommended by the Department. In this way, a quantity of seed of a locally-grown variety known as Prairie Queen, from Mount Russell, was now being tested. The Department would be glad if farmers would forward a sample of seed of any local varieties they liked. Only by experimenting in this way could one district help another and the value of locally grown varieties be correctly ascertained.

On the question of selecting seed, it was laid down as a general rule that the best cob of maize was one that was heavy in proportion to its size. Weight was what farmers were after, and weight was what the grain was sold by. That was one of the most important points in selection.

Regarding the tips of the cobs—it was usually held that a cob should be well filled to the tips. That was all right for exhibition and show, but in experiments carried out to determine whether the cobs best filled out gave increased yield, the contention was not entirely borne out. As to the butts, it was found that cobs which left a deep depression in the butt when the shank had been removed gave better results. Straightness of row was usually a quality to seek after.

Too much stress could not be laid on the necessity for uniformity. Maize crossed easily, and it was consequently a matter of great difficulty to keep varieties true, but careful selection with a view to uniformity would overcome a lot of that trouble. The very best types from the cobs saved for seed should be chosen, and planted in a special seed-plot year by year. This would give better results in less time than selection from a larger field.

America, though the home of maize, had only in the last ten or fifteen years adopted what was known as the ear-to-row test. This had proved to be a most effective method of improving the maize yield. An experiment along those lines had been carried out last year on Mr. J. Ditzell's farm, with striking results. The differences ranged from 85 lb. per row to 225 lb., which showed how important selection could be. All the cobs used had been selected with a special eye to uniformity, so that the results were all the more striking. Under the ear-to-row system, only half of each cob was used in sowing a row, the other half being carefully numbered and put away. The following year, about ten or a dozen of the half cobs from which the best results had been obtained were sown separately. The result was that a lot of the depreciation that would inevitably result through cross-pollination with inferior yielding strains was immediately eliminated.

For this district he favoured the addition to the soil of humus, in the shape of crops of peas or clover turned in, in preference to manuring in other forms. At Coramba, on the North Coast, a maize yield which for years on end had not exceeded 50 bushels per acre (on land not particularly suited to maize) rose by gradual stages to 91 bushels under experiments with the ploughing in of field peas. On the Macleay, an experiment plot last year showed a yield of 101 bushels to the acre from land where field peas had been continually turned in, as against 59 bushels from identical soil not so treated.

Cultivation also played a most important part. One of the best object lessons was seen last year on an experiment plot carried out on the North Coast. Rain fell on this plot soon after the field was planted and the ground was harrowed over as soon as conditions would allow before the maize came through. Another heavy downpour came soon after, and again consolidated the ground, and it was intended to again harrow the growing crop when the plants were 4 or 5 inches high. As the conditions did not allow of this being done until the plants were 8 or 9 inches high, a cross-harrowing was then given in the middle of a bright day when the plants were tough and supple. The result was that not a single plant was broken down nor torn out. The third cultivation was performed with a disc cultivator. From that time the crop grew rapidly, and a month later, at the tasselling stage, there was not a single weed to be seen throughout the plot. The appearance of this plot was in striking contrast to other crops in the district, and the difference in yield was 30 to 40 bushels per acre in its favour.

Reference was made to what was to some a new method of harvesting largely used in America, where the winters are somewhat severe. It is claimed for this method that it will mature a crop a fortnight earlier, as well as make an abundance of useful fodder available. It consists in harvesting the corn, stalk and all, by means of a binder or cutter, and stooking the stalks after the manner of wheat, about 300 or 400 stalks in each stook. The crop is cut at the hard-dough, or glazed stage of the kernels and while the fodder is still green. The sap left in the stalks considerably fills out the grain and the stooks are left for three or four weeks, when the cobs are husked from the stalks, and a valuable bulk of cured fodder remains. The advantage of this method in a season when fodder was scarce could easily be seen, and, in addition, the paddock had been cleared of corn stalks and was ready for the plough.

Kellyville.

Mr. W. le Gay Brereton, Assistant Fruit Expert, gave a pruning demonstration under the auspices of this branch on 6th November. On 10th idem the monthly meeting was held, the business being confined to arrangements for a visit to Hawkesbury Agricultural College and to preparations for the coming district show.

Lidcombe.

A meeting took place on 24th September, when Mr. H. Wenholz, Inspector of Agriculture, delivered a lecture on manures and manuring, with special reference to vegetables. About sixty persons were present. At the conclusion of the lecture a number of questions were answered by Mr. Wenholz, and the prizes won by members who had gained the highest number of points during the year with fruit, vegetables and flowers were presented by him.

At a meeting held on 8th October, over forty members were present in spite of heavy rain. A number of members contributed short papers on tomato growing, and a spirited discussion subsequently took place.

A meeting was held on 22nd October, at which forty-three members were present. Mr. H. E. Blackman, of Parramatta, gave a lecture on dry farming, which was followed by a general discussion in which several members took part. Seven new members were admitted.

Lower Portland.

A meeting was held on 5th November, at which a discussion took place on the summer fruit crop.

Middle Dural.

A lecture on manures and manuring was given by Mr. A. T. Hunter, Fruit Inspector, at a meeting of this branch on 5th October.

Mr. Hunter described the various commercial fertilisers and farmyard manures. He explained the characteristics of the various fertilisers, and gave the time and method recommended for their use. After dealing with the importance of a sufficient humus supply, the action and benefit of green manuring was described. The most suitable crops for green manuring in this district were mentioned, together with the most suitable methods for their cultivation, and also the utility of lime and its action on the soil. Subsequently a number of questions were answered by the lecturer.

Miranda.

On 5th November an interesting and instructive lecture was delivered before members of this branch by Mr. James Hadlington, Poultry Expert.

THE EMBRYOLOGY AND LIFE OF THE CHICKEN.

Some slides were first exhibited illustrating an up-to-date poultry farm in contrast with the methods and equipment of the past, the object being to show what method and systematisation can do in commercial poultry-farming. The anatomy of the hen was next shown, being followed by slides illustrating the ovaries, the development of the yolk, and its subsequent detachment into the oviduct, where it gathered the albuminous secretion known as the white of the egg. Passing on its way, the shell was formed and a perfect egg evolved.

Incubation was then touched upon, with the different stages in the development of the embryo, as seen under a microscope, from three days onward until the chicken makes its appearance from the shell.

Some problems of brooding were dealt with, and the absolute necessity for good brooding with the object of securing proper development was insisted upon as essential to success.

At the close of the lecture questions were asked, particularly relating to systems of brooding. Mr. Hadlington was not inclined to be too dogmatic. One often found that more or less success was being obtained with the most unpromising brooders, but sooner or later the person with inferior brooding equipment found that it paid to put in good brooders. One thing upon which stress was laid was that better development (other things being equal) was obtained by brooding in small flocks than in large. He, however, found that there was a disposition to compare results between very crude makeshift brooders and others of an expensive character which, while perhaps giving improved results, might not be the best obtainable. A hot water circulatory system illustrated had proved both successful and economical.

Tallong.

A meeting was held on 3rd November, at which Mr. Hall gave an address on the picking, packing and marketing of fruit.

Tennyson.

The monthly meeting of Tennyson branch was held on 6th October, when the Chairman, Mr. L. Parker, read a paper from which are taken the following paragraphs. Mr. Parker made it clear that the special application of his paper was to the Kurrajong district.

TOMATO CULTURE.

Tomatoes may be grown in any soil providing the shale is not too near the surface, and also providing the soil is not worked out. They thrive best in new land.

In the preparation of the soil the grower should begin early. The land should be worked deeply throughout the winter, as this will assure a fair amount of moisture for a considerable part of the early summer. Deep winter ploughing is very necessary for early tomato growing.

I would recommend that the land be drilled deep. The walls of the furrow will protect the young plants from westerly winds, which are, as a rule, prevalent in the spring time. Drills should be about 4 feet apart, and the plants about the same distance from each other in the drills.

I find blood and bone a very good manure for tomatoes, generally using as much for each plant as can be held in one hand, and working it well into the bottom of the drill. It is imperatively necessary that manure should be kept away from the surface, as the surface of most Kurrajong soils dries very quickly, and it is reasonable to assume that plant life does not reap much benefit from manure unless it is kept moist.

There are not many varieties to choose from as far as Kurrajong is concerned. I have come to the conclusion that the two most suitable are Chalk's Early Jewel and Landreth's Earliest, the last named being extremely early but not quite so hardy as the first. The fruit of both varieties is smooth and well shaped.

The greatest difficulty that growers of early tomatoes have to face (in my opinion) is the raising of the plants. My seed-bed is adjacent to the sunny side of a brick wall. In preparing this, it is not advisable to work the ground too deep, because it is necessary to keep the roots as near as possible to the surface, as a better root system is thus ensured for the young plant when it is fit for transplanting. My method is to work the ground very fine and using a little manure, sow the seed and water well, finally covering with about an inch of fine stable manure. Don't use water too frequently after the plants begin to show, as it is a great advantage to have hardy plants. I would recommend the sowing of seed about the end of June, and with proper attention the plants should be fit by August.

Transplanting should be done in August if possible. It is necessary to water the plants well about three or four days before transplanting, as this will cause the plants to make a good root growth. If possible allow a little earth to remain on the root. Don't wait for rain to begin transplanting if the ground and plants are ready in August. Greater success will be met with if the ground is a little dry, rather than if it is too wet, as it is always advisable to apply a little water to the roots.

As regards cultivation, I don't think it is possible to cultivate too much, providing it is only light; but in no case should the plants be knocked about, as, if they are well grown, they are easily broken. Hilling, in my opinion, tends to dry the ground.

Don't wait for the tomatoes to get red ripe before starting to pick them, as it is good management not to have too much ripe fruit in the consignment. As soon as a tomato has the slightest tinge of colour it is fit for market. Like all other fruit it is an advantage to class and pack, and don't forget that ripe tomatoes and green ones don't look well in the same case.

Discussion ensued on several matters interesting to growers, mention being specially made of the necessity of selling peas hereafter by weight instead of by bulk.

Present unsatisfactory methods of marketing were mentioned briefly.

It was agreed to ask the Government to establish a testing plot for pea seed in the district. In the last two seasons a lot of inferior seed that is not true to name has been causing growers losses, and it is thought that plots would enable seed to be tested to ascertain what varieties are most suitable for the district.

Tingha.

A meeting of local residents was held on 6th October, when it was decided to form a branch of the Agricultural Bureau. A substantial roll of members has already been secured, and there is every hope that the new branch will be most successful in its work.

At a meeting on 11th November, correspondence was read from the Department of Agriculture approving the formation and registration of the branch. Mr. J. L. Deasey was appointed Librarian, and it was agreed to make inquiries about the loan of books on agricultural subjects.

The new bulletin, "Lime on the Farm," was read to the meeting, and produced some discussion.

Toronto.

A meeting was held on 9th October, when after formal business had been transacted, a discussion took place on vine culture.

The schedule of prizes for the flower, fruit and vegetable show organised by this branch provided prizes for a considerable number of sections, and the exhibition should stimulate a healthy spirit of rivalry amongst residents of the district.

Woonona.

A meeting was held on 9th October, at which Messrs. W. H. Moss and G. Fowler read papers dealing with various aspects of poultry farming.

Yarramalong.

The annual meeting was held on 31st October, when the election of officers took place for the ensuing year. The Chairman's report showed that considerable progress had taken place during the year.

Yurrunga and Avoca.

At the usual monthly meeting, held on 27th October, Captain Darbishire gave a lecture and demonstration on rope splicing and knotting.

Orchard Notes.

DECEMBER.

W. J. ALLEN.

Cultivation.

IT frequently happens during a wet spring and early summer in the tableland districts that the weeds get beyond the cultivators, and that owing to the frequent sprayings necessary to apple and pear-growing during the same period, the soil becomes compacted. In the latter cases it is a good plan to have the orchard ploughed again during the latter part of this month or early in January, when the heaviest part of the spraying is completed. This second ploughing will put the land in good condition before the busiest part of the fruit season commences in these districts. In districts where the plough is not necessary at this season, the ground should be kept in good order with the cultivator.

Irrigation.

Where irrigation is practised in our inland districts, a thorough watering for all trees and vines is generally essential towards the end of this month, this being the third watering of the season. However, this season in the southern parts of the State unusual rains have occurred, and irrigation has been almost unnecessary. Should the season become more normal, the land should be watched and the watering given as soon as necessary.

Codlin Moth.

In most apple and pear districts it will be time to make the third application of lead arsenate during this month and the next. Any fruit affected with the larvæ of codlin moth should be regularly collected and destroyed by burning or boiling.

Pear and Cherry Tree Slug.

Trees affected with this pest should be sprayed with arsenate of lead. Where cherries are forward it will be necessary to delay the spraying until the fruit is picked.

Grape Vine Moth.

Where the vine moth is present, the vines should receive a spraying with arsenate of lead.

Black Spot of Grape Vine.

If the weather is moist and black spot is still making headway, the vines should receive another application of Bordeaux mixture (summer strength); from this treatment must be exempted early varieties in early districts where the vines may be too forward.

Black Spot of Apple and Pear.

Bordeaux mixture or lime-sulphur (summer strength in both cases) should be added to the lead arsenate spray if black spot has not ceased to spread in these trees.

Summer Thinning.

Young trees will still require attention, checking strong leaders to allow the weaker ones to catch up to them, and thinning slightly where they are too numerous. This thinning should not be too severe, however, as the leaders that are left are more likely to be blown out by the wind if all those about them are removed. Older trees that are making vigorous growth, especially those that were topped heavily during the winter, may have some of the superfluous leaders removed if the growth is too dense. Shoots growing from stock below buds or grafts should be removed. All suckers from the roots should also be taken away.

Budding.

Apricots and other fruits that form their buds early can be budded this month. Trees budded at this time can be cut back about three weeks after the buds have taken, and the growths thus started in the same season. Such budding is termed " spring budding," in distinction from " dormant budding," in which case the work is carried out later and the growths do not start till the following spring.

Drying.

Apricots will be fit for drying towards the end of this month. The fruit should be thoroughly ripe. The method is to cut it in two, remove the pit and place the cup upwards on trays. As they are filled, the trays should be stacked in the sulphur chamber away from the sun and from draughts, until fumigation is actually carried out. Apricots should be subjected to sulphur fumes till the cup, *i.e.*, the depression left by removal of the pit, is almost full of juice. This generally takes from eight to ten hours. The fruit is then exposed to the sun or placed in the evaporator, as the case may be. It should not be allowed to dry out until it is hard, but should be taken up when it is in a tough, pliable condition. Further particulars of the process may be obtained from Farmers' Bulletin, No. 52, " Fruit Drying," which may be obtained free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Special Notice.

In forwarding specimens of fruit to the Department for naming, it is advisable to send at least six specimens. These should be typical, and should have stems of average length. The fruit should be in a firm condition, but not ripe, as it is sometimes necessary to send it on to one of the Department's orchards for verification. A description of the tree, when the fruit ripens, the name, if any, by which the fruit is known in the district, and any other information which may be of assistance, should be submitted with the specimen. Where more than one variety is sent, there should be a small paper label gummed on each, bearing a distinguishing number.

A Warning.

Downy Mildew of Grape Vines (*Plasmopara viticola*).—Though this disease has so far not been found in New South Wales, it was reported to have broken out in Victoria last season. Vine growers, therefore, should keep a close watch, and should any disease appear with which they are not familiar, they should forward specimens to the Department for examination by the Biologist. This fungus attacks practically all species of cultivated or wild grapes, the young or green portion of the growing vine, leaves, shoots and berries being affected. Under ordinary conditions, however, it is largely confined to the leaves, and its injurious action consists in the production of coloured spots which prevent or inhibit normal physiological activities. The first indication of the disease is certain definite spots, which upon the upper surface are yellowish in colour and irregular in size and form, but which upon the lower surface of the leaf are not so evident. Almost simultaneously with the production of the spots on the upper surface, the spores of the fungus are formed on the lower surface. Later in the season the spots turn brown. Dark depressed areas may be produced upon the shoots. Commonly the fungus is found upon the berries only when young, although a form of brown rot, sometimes called "grey rot," may be produced when the berry is more than two-thirds grown. The fungus threads ramify in the tissue of the leaf, and some of them emerging through the stomata produce the spores of the fungus on their branching tips. A form of spore different from the above is produced in the autumn in the discoloured, shrivelled parts of the leaves. This type of spore helps to carry the fungus over the winter; hence as far as possible, all dead leaves and prunings should be burnt. As a spray for the control of this fungus, Bordeaux mixture is the most effective. A spray in the strength of 6-4-50 should be used just as the buds are spreading, to be followed by another before the blossoms open.

WILD MELON FRUIT AND BLINDNESS IN HORSES.

IN connection with the experiments in the feeding of the fruit of the wild melon to horses, sheep, &c., as reported in the November issue of the *Agricultural Gazette*, a correspondent at Alectown writes :—

In reading the notes of "Feeding Experiments with Wild Melon Fruit," I notice in the case of the horse that it would not eat the fruit unless mashed with bran. From my experience I find that in a dry year when grass is scarce, horses will eat the fruit without any trouble, and they will not be affected in the sight for some time.

I have two mares which were foaled in 1912, and these were running in a paddock that had only melon in it that year. No. 1 got very thin and rough-coated, but in spring picked up well. At three years old she could not get about at night, and at four years old she was stone blind, although her eyes looked as bright as any others. No. 2 was always near-sighted up to last autumn, which was very dry but had plenty of melons growing. I used to notice her picking up the fruit from the dry grass and eating them. She in now nearly blind also. I have another horse which eats the fruit, and he is also near-sighted.

From my experience, it will be seen that horses will not show any signs of blindness for one or two years, and if they are still kept on melons they will go blind.

Neighbours with melon-infested paddocks have also had the same experience.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1918.

Society.	Secretary.	Date.
Gosford and Brisbane Water A. and H. Association	O. F. Ash	Jan. 18, 19
Albion Park A., H., and I. Association	H. G. Fraser	,, 30, 31
Kiama Agricultural Association	G. A. Somerville	,, 25, 26
Berry Agricultural Association	A. McConaghy	Feb. 6, 7
Coramba District Agricultural Association	H. E. Hindmarsh	,, 13, 14
Central Cumberland A. and H. Assocn. (Castle Hill)	H. A. Best	,, 15, 16
Wyong Agricultural Association	W. Baldwin	,, 22, 23
Dapto A. and H. Society	J. J. Cook	,, 20, 21
Guyra P., A., and H. Association	P. N. Stevenson	,, 20, 21
Alstonville A. Society	C. D. McIntyre	,, 26, 27
Yanco Irrigation Area A. Society	F. E. Harrison	,, 26, 27
Bangalow A. and I. Society	W. H. Reading	,, 26, 27
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 26, 27, 28
Moruya A. and P. Society	H. P. Jeffery	,, 27, 28
Robertson A. and H. Association	R. Graham	,, 27, 28
Dorrigo and Guy Fawkes A. Association	R. R. Blair	,, 27, 28
Gunning P., A., and I. Society	S. A. Beer	,, 27, 28
Inverell P. and A. Association	J. T. Dale	,, 27, 28; March 1
Newcastle A., H., and I. Association	E. J. Dann	,, 27, 28; March 1, 2
Tenterfield P., A., and H. Society	R. G. White	Mar. 5, 6, 7
Tamworth P. and A. Association	J. R. Wood	,, 5, 6, 7
Bega A., P., and H. Society	H. J. B. Grime	,, 6, 7
Braidwood P., A., and H. Association	L. Chapman	,, 6, 7
Tumut A. and P. Association	T. E. Wilkinson	,, 6, 7
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—— **Indigo** (*Swainsona luteola*). [*See* Poisonous Plants—*Specific.*]
—— **Melon** (*Cucumis myriocarpus*). [*See* Veterinary Science; Weeds—*Specific.*]
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